

91 01335



BAY AREA AIR QUALITY MANAGEMENT DISTRICT

ALAMEDA COUNTY
Edward R. Campbell
Loni Hancock
Greg Harper
Frank H. Ogawa

CONTRA COSTA COUNTY
Paul L. Cooper
(Chairperson)
Sunne Wright McPeak
Tom Powers

MARIN COUNTY
Al Aramburu

NAPA COUNTY
Paul Battisti

SAN FRANCISCO COUNTY
Roberta Achtenberg
Harry G. Britt

SAN MATEO COUNTY
Gus J. Nicolopoulos
Anna Eshoo
(Vice Chairperson)

SANTA CLARA COUNTY
Martha Clevenger
Rod Diridon
Roberta H. Hughan
Dianne McKenna

SOLANO COUNTY
Osby Davis

SONOMA COUNTY
Jim Harberson
Patricia Hilligoss
(Secretary)

July 17, 1991

Dear Interested Party:

Enclosed for your review is the Draft Socioeconomic Report for the 1991 Bay Area Clean Air Plan (CAP). The Socioeconomic Report has been prepared by the Bay Area Air Quality Management District (BAAQMD), Lead Agency for the CAP under the California Environmental Quality Act (CEQA).

The CAP outlines a regional strategy to improve air quality in the Bay Area. The CAP includes many proposed control measures designed to reduce air pollutant emissions from motor vehicles and from industrial and commercial processes.

Although it is not required under CEQA, the BAAQMD has prepared this Socioeconomic Report in order to identify potential social and economic impacts of the CAP. A copy of the Socioeconomic Report is being sent to all organizations and individuals that received the Draft Environmental Impact Report (EIR) on the CAP. As required under CEQA, the BAAQMD has prepared an EIR on the CAP which identifies environmental impacts that could result from implementation of the CAP.

Comments or questions on the Draft Socioeconomic Report may be addressed to:

Henry Hilken, Planner
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, California 94109
(415) 771-6000

The BAAQMD Board of Directors will conduct a public hearing on the Draft CAP and the Draft EIR on Wednesday, July 24, 1991, at 7:00 p.m. The hearing will be held at the Cathedral Hill Hotel, Van Ness at Geary, in San Francisco.

Sincerely,

A handwritten signature in dark ink, appearing to read "Milton Feldstein".

Milton Feldstein
Air Pollution Control Officer

MF:ey

THANK YOU FOR YOUR
TRUST AND COOPERATION

2014-2015

DESIGNED BY
JULIA A. BROWN

2014-2015

Socioeconomic Report
for the
Bay Area 1991 Clean Air Plan



Bay Area Air Quality Management District

July 1991

SOCIOECONOMIC REPORT
BAY AREA 1991 CLEAN AIR PLAN

July 15, 1991

Prepared for the
BAY AREA AIR QUALITY MANAGEMENT DISTRICT

by

Applied Development Economics
3254 Adeline Street
Berkeley, CA 94703
(415) 653-3803

TABLE OF CONTENTS

	<u>Page</u>
1. Introduction and Summary of the Report	1
1.1 Purpose and Organization of the Report	1
1.2 Summary of the Socioeconomic Analysis	3
2. Overview of the Regional Economy	11
2.1 Economic Structure of the Region	11
2.2 Projected Growth in the San Francisco Bay Region	14
2.3 Labor Force and Jobs/Housing Balance Issues	17
3. Impacts to Business and Industry	19
3.1 Impacts of Transportation Control Measures	19
3.2 Impacts of Stationary Control Measures	23
3.3 Economic Effects of Improved Health Conditions	37
4. Impacts to Commuters and the General Public	39
4.1 Demographic Characteristics of the Region	39
4.2 Impacts of Transportation Control Measures	45
4.3 Impacts of Stationary Control Measures	49
5. Impacts to Local Government	51
5.1 Trends in Local Government Spending	51
5.2 Impacts of Transportation Control Measures	59
5.3 Impacts of Stationary Control Measures	62
5.4 Summary of Local Government Fiscal Impacts	63
6. Summary of Employment Impacts	65
6.1 Direct Employment Impacts	65
6.2 Secondary Employment Impacts	68

Table of Contents (Continued)

Page

7. Alternatives	71
7.1 No Project	71
7.2 Accelerated Market-Based TCMs	72
7.3 ROG First Control Strategy	72
8. Report Authors and Persons Contacted	73
8.1 Report Authors	73
8.2 Persons Consulted	74

LIST OF TABLES

	<u>Page</u>
1. Summary of Socioeconomic Impacts of the CAP	4
2. Detailed Employment Growth Trends in California and the Bay Area 1978-1988	12
3. San Francisco Regional Household and Employment Projections	15
4. Estimated Costs of Proposed Stationary Control Measures	25
5. Estimated Direct Compliance Costs by Industry	28
6. Estimated Direct Compliance Costs as a Share of Industry Output	29
7. Ethnic Characteristics of California and Bay Area Counties, 1990	41
8. Income and Poverty Characteristics	43
9. City and County Expenditures in the Bay Area, 1978-1988	52
10. Metropolitan Transportation Commission Allocations by Source	57
11. Major Transit Services in the Bay Area	58
12. Summary of Employment Impacts	66
13. Occupational Distribution of Employment Changes	69

1. INTRODUCTION AND SUMMARY OF THE REPORT

1.1 Purpose and Organization of the Report

This report has been prepared as an informational document to accompany the 1991 Clean Air Plan (CAP) as it is reviewed by the public, business representatives and governmental agencies in the Bay Area. The report addresses issues related to the economic effects of the control measures proposed in the CAP on consumers, commuters, businesses and local government in the region. These issues are considered vital to a complete understanding of the CAP and its significance for the region. These are not issues that are appropriate for discussion in an environmental impact report (EIR), although certain effects related to population, employment and housing growth and distribution are discussed in the Environmental Impact Report on the CAP.¹ For this reason it was deemed appropriate to prepare a separate report on the socioeconomic effects of the CAP.

The impacts of the CAP affect three main groups in the local economy. Many of the control measures affect business and industry directly by requiring shifts to new types of equipment, new industrial processes or chemical substances, and changes in transportation equipment or practices. Some of these impacts may result in changes in employment and changes in the prices of products manufactured by the affected industries. These kinds of effects would impact workers and consumers directly. Workers would also be affected directly by many of the transportation control measures that may increase their costs to commute to work. The impacts of the CAP on household expenses are addressed in the second major section of the report. Finally, local government would be called upon to implement a number of the control measures outlined in the CAP. This would occur both in terms of planning activities and land use decisions that must be undertaken at the local level and also as local government institutes many of the same kinds of commuter and operational programs requested of large private employers in the region. The impact of the CAP on local government is the subject of the third section of the report. The order of the discussion of impacts in the socioeconomic report does not necessarily indicate the relative importance or magnitude of the effects on the three major groups mentioned above. We begin with impacts to business and industry

¹ CEQA provides that while economic or social information may be included in an EIR, economic or social effects shall not be considered significant effects on the environment unless a chain of cause and effect to actual physical changes can be demonstrated (Section 15131). Since the CAP is a long range set of programs, rather than a specific project, it is not possible to trace such connections between the costs that various groups in society would bear in implementing the plan to definitive physical environmental changes.

because many of the direct impacts in this sector also have indirect effects on households and government.

The report presents quantitative data where available to indicate the magnitude of the impacts of the CAP. The BAAQMD retained the firm of Deakin/Harvey/Skabardonis to estimate costs of implementing the Transportation Control Measures (TCMs) as well as the value of travel time benefits from the measures that reduce traffic congestion or increase travel mobility in the region. The report also presents information about increased employment resulting from the mobility improvements included in the CAP. These estimates are based in part on analysis prepared for the Metropolitan Transportation Commission (MTC) on the Regional Transportation Plan (RTP). Working with BAAQMD staff, Applied Development Economics, Inc. estimated the costs of compliance for the Stationary Control Measures (SCMs) and determined how the sum total of the costs would affect specific industries. Estimates of impacts to employment of the SCMs are also presented in the analysis.

The report only attempts to quantify direct and administrative costs, employment effects, and travel time benefits. The following factors have not been quantified:

- o fuel savings benefits from congestion relief/trip reduction;
- o any travel time costs due to mode shift from single-occupancy-vehicles (SOV) to carpooling or transit where these modes may be slower than autos (i.e. waiting for buses or increased travel time);
- o health, visibility, agricultural, and materials benefits from air quality improvements.

As the CAP acknowledges, most of its benefits are difficult to quantify, although they are substantial. This report presents a number of the economic costs of the CAP which must be balanced against the benefits. It does not attempt, however, to present a comprehensive cost/benefit analysis of the CAP. The information provided in the report, though, should be helpful to local policy makers, businesses and the public as they consider the need for improved air quality in the Bay Area.

1.2 Summary of the Socioeconomic Analysis

Table 1 provides an overview of the impacts of the CAP. The table shows which impacts have been quantified in terms of either annual dollar amounts or number of jobs. For unquantified impacts, the table indicates whether the effects are generally beneficial or negative. The relative severity of the impacts is indicated in a general fashion by the number of (-) or (+) signs in each entry. The summary discussion below follows the analysis in the main body of the report.

Impacts to Business

The CAP will impose increased costs of doing business in the Bay Area, although there will also be countervailing benefits in terms of reduced congestion, reduced health care costs and possibly greater housing availability. The CAP will also create new business opportunities as new technologies are developed and marketed to meet the requirements for reduced emissions. In addition, the substantial expansion of the mass transit system in the region will boost employment and create added flexibility for the movement of goods and people through the economy.

Transportation Control Measures

- o The employer-based trip reduction programs are estimated to cost local businesses \$150 million per year to implement. These costs would be primarily for hiring transportation coordinators and for administrative and accounting activities. Employers would have the option in Phase 1 of the CAP to charge for employee parking up to \$3.00 per day. Employers choosing this option would fund their program costs, including any financial incentives to employees for transit use or carpooling, with these revenues. In Phase 3, the employee parking fees would become mandatory, and all business costs of the programs would shift to the workers.
- o The mobility improvements would reduce costs for business transportation as well as other travelers. It is estimated that the business share of travel cost benefits of Phase 2 of the CAP would reach \$26.3 million per year when the improvements are complete. This benefit is in addition to direct air quality benefits such as increased worker productivity due to reduced health costs. Annual business costs for the increased gas taxes, bridge tolls, and vehicle registration fees proposed in Phase 2 are estimated at \$22.3 million.
- o Construction of the transit improvements included in the CAP are estimated to create about 250,000 person years of construction employment. In addition, it is estimated that the operation and maintenance of the expanded transit systems would create approximately 2,880 new permanent jobs in the region.
- o The market-based fees and charges proposed for Phase 3 of the CAP would significantly increase business transportation costs. These costs are estimated to reach about \$332 million per year, although they would also return \$112 million annually in time savings for travel. Firms that provide transportation or hauling services will be affected most directly by the market-based measures, but many other business sectors would also be impacted. The cost impacts would reverberate through the economy to consumers in the form of higher prices.

TABLE 1
SUMMARY OF SOCIOECONOMIC IMPACTS OF THE CAP

CAP MEASURES	AFFECTED GROUPS							
	Business and Industry		Commuters		Low Income Groups		Bay Area Government	
	Benefits	Costs	Benefits	Costs	Benefits	Costs	Benefits	Costs
TRANSPORTATION CONTROL MEASURES								
Employer-Based Trip Reduction <i>(TCMs 1,2)</i>								
Highway Travel Time Savings *	\$10.7 million		\$108.5 million		(++)		(++)	
Administrative Cost *		\$150 million						\$5 million
Phase 3 Employee Parking Fees (Social Transfers) *				\$1.46 billion		(---)		
Mobility Improvements, Traffic Operation Management, Transit User Incentives <i>(TCMs 3-15)</i>								
Highway Travel Time Savings *	\$26.3 million		\$266.3 million		(++)		(++)	
Construction Employment (ten years)	25,000 jobs				(++)			
Transit Operation Permanent Employment	2,880 jobs				(++)			
Indirect Permanent Employment	6,450 jobs				(++)			
Implementation Costs *								\$698 million
Driver Expenses (Social Transfers) *		\$22.3 million		\$203.6 million				
Indirect Source Review <i>(TCM 16)</i>								
Highway Travel Time Savings *	\$4.5 million		\$45.5 million		(++)		(++)	
Administrative Costs *								\$12 million
Development Costs		(--)						
Implementation Support <i>(TCMs 17-21)</i>								
Highway Travel Time Savings *	\$8.4 million		\$85.1 million		(++)			
Administrative Costs *								\$4 million
Increased Housing Production	(+)		(+)				(+)	
Market-Based Measures <i>(TCM 22)</i>								
Highway Travel Time Savings *	\$112 million			\$1.1 billion	(++)		(++)	
Driver Expenses (Social Transfers) *		\$332.4 million		\$3 billion		()		()

* All dollar figures are annual benefits or costs expressed in 1991 dollars.

TABLE 1 (Continued)
SUMMARY OF SOCIOECONOMIC IMPACTS OF THE CAP

CAP MEASURES		AFFECTED GROUPS							
STATIONARY SOURCE CONTROL MEASURES	Business and Industry		Commuters		Low Income Groups		Bay Area Government		
	Benefits	Costs	Benefits	Costs	Benefits	Costs	Benefits	Costs	
Compliance Costs									
Maximum Total Costs *		\$339.8 million						(-)	
Major Industry Costs									
General Manufacturing *		\$102.1 million							
Utility Industries *		\$115.4 million							
Petroleum Refining *		\$76.9 million							
Restaurants *		\$13.2 million							
Transportation Equipment *		\$8.3 million							
Concrete and Glass Manufacturing *		\$6.6 million							
Employment Losses Due to Combined Compliance Costs									
Directly Related Permanent Jobs				2,160 jobs		(--)			
Indirect/Induced Permanent Jobs				8,970 jobs		(--)			
Employment Gains From Control Technologies									
Directly Related Permanent Jobs			1,080 jobs		(++)				
Indirect/Induced Permanent Jobs			4,490 jobs		(++)				
GENERAL CAP IMPACTS									
Health Benefits									
Reduced Health Costs	(++)		(++)		(++)		(++)		
Slower Health Services Employment Growth				(-)		(-)			
Increased Worker Productivity	(++)						(++)		
Increased Agricultural Production									
Lower Prices					(+)				
Increased Employment			(+)						
Other Impacts									
Fuel Savings	(++)		(++)		(++)		(++)		
Increased Travel Time on Transit		(--)		(-)		(-)		(-)	
Reduced Materials Deterioration	(++)		(++)		(++)		(++)		
Increased Property Values	(++)		(++)				(++)		
Improved Quality of Life	(++)		(++)		(++)		(++)		

* All dollar figures are annual benefits or costs expressed in 1991 dollars.

These measures are shown in Table 1 as "Social Transfers," meaning that they do not represent added costs to society as a whole, but rather are transfers of revenue within society to achieve the purposes of cleaner air quality. Thus, although the measures increase the business cost of highway travel, the revenues also constitute benefits for Bay Area residents and businesses in terms of cleaner air quality and improved transit mobility.

- o Indirect source control policies could increase development costs in certain locations due to design or land use requirements imposed to reduce air quality impacts. However, ABAG has estimated that policies to increase residential development in proximity to transit facilities could increase regional production of housing by more than 162,000 units by 2010 without impairing the economic development potential of the Bay Area.

Stationary Control Measures

- o The known costs of compliance imposed on business by the stationary source control measures range from \$292.1 million to \$339.9 million per year (1990 dollars). The maximum cost represents about 0.33 percent of the annual output of the affected industries. In general, these costs are not anticipated to have a substantial impact on the regional economy.
- o The electric and gas industry would sustain the highest annual dollar impact at about \$115.4 million per year. It is likely that 75 percent of the costs would be absorbed by PG&E ratepayers, but at an average annual cost of \$19.00 per customer, including commercial accounts, this is not expected to have a major impact on household expenditures.
- o The petroleum industry would sustain increased costs of nearly \$80 million per year, mostly in amortized capital expenditures. These costs represent about 1.1 percent of the annual value of petroleum industry output in the Bay Area, but about 60 percent of the capital expenditures the industry made in 1987, the last year for which such data is available.
- o The restaurant sector would make aggregate expenditures of \$13.2 million per year to pay for improved charbroiling equipment. While this represents only 0.24 percent of annual restaurant sales in the region, some smaller establishments may have difficulty financing the new equipment.
- o In terms of new business opportunities, to the extent that new equipment and products needed to comply with the control measures can be produced locally, the costs outlined above will be translated into revenues for other firms in the region.

Impacts to the Public

Transportation Control Measures

- o In Phase 1 of the CAP, businesses would have the option to charge workers for parking. In Phase 3, these fees would become mandatory. For employees unable to avoid or share the employee parking charges, the costs would be about \$750 per year. With normal ridesharing levels, it is anticipated that the average cost per employee would be about \$470 per year for an annual cost of \$1.46 billion to workers. Businesses may also provide workers financial incentives to use transit or carpool/vanpool systems. Employees able to use these program would benefit in terms of lower commuting costs.

- o The mobility improvements constitute a major benefit to commuters and the general public. It is estimated that the public share of travel benefits for measures instituted through Phase 2 of the CAP would amount to \$266.3 million per year. The public costs of the revenue measures proposed in Phase 2 are estimated at \$203.6 million annually.
- o The market-based measures would levy a substantial cost, estimated at \$3 billion annually, on the public. Spread across all households in the region, this is estimated to increase the cost of living for poverty-level households by nearly 7 percent of their gross income, compared to 2 percent for average-income households. The reduced congestion achieved through these measures would result in savings of approximately \$1.1 billion annually to the region. In addition, the transit use incentives included in the Phase 2 mobility measures and proposals for an income tax credit for transportation costs would help mitigate the financial impacts of the market-based measures.

The phasing of the CAP TCMs is critical to the economic impact they will have. If the mobility improvements are in fact in place prior to the imposition of the market-based measures, then suitable transportation alternatives will be available to help area residents, particularly lower income families, to avoid much of the impact of the revenue measures. Without the expanded transportation system, the socioeconomic impact of Phase 3 will be severe.

- o To the extent that indirect source control or intensified zoning policies result in increased housing production, this could help to moderate housing costs.
- o Certain vehicle control measures may impact low income residents who are without resources to buy or maintain less polluting vehicles. The financial structure of such programs should include suitable compensation for such drivers.

Stationary Control Measures

- o As noted above, there may be price impacts on consumer products as a result of certain Stationary Control Measures (SCMs). Utility ratepayer costs also may increase. However, no instances have been identified where such price impacts would be significant.

Local Government Impacts

- o The transportation planning activities, youth transportation improvements, and public education activities are proposed to be funded through MTC or BAAQMD grants or direct technical assistance with no financial contribution required from general-purpose local government funds.
- o Local governments may be involved with implementing some of the transportation control measures proposed in the CAP, including enforcing the employer-based trip reduction measures, preparing air quality elements for their general plans, preparing bicycle plans, conducting planning and review activities associated with indirect source review, and developing alternative land use policies for improving air quality conditions. It is estimated that city and county governments may spend \$20 million per year on such activities. On an average basis across all the cities and counties in the region, this amount would not appreciably increase the rate of per capita expenditures by local government.
- o Local government may experience a more direct impact from the clean vehicle fleet rule.

The costs for this measure, even for the private sector, are unknown at this time, but conversion of fleet vehicles to alternative fuels could require significant expenditures by local governments and school districts.

Summary of Employment Impacts

- o It is estimated that the increased business costs associated with the SCMs could result in regional employment losses of 2,160 jobs. As the economy adjusts to the CAP, however, it appears likely that at least half this number of jobs could be generated in other industries providing the technology and products to meet the requirements for lower emissions in industrial processes.
- o An additional unknown impact could result in the health services sector as health conditions improve due to better air quality. It is not known whether this effect would exceed the anticipated growth in demand for health services due to increasing population and employment in the region, and actually result in fewer jobs. More likely, only the rate of employment growth in this field would decrease in the future.
- o The market-based TCMs will have significant cost impacts for business. The employment impact of this is less certain. Because of the widespread incidence of the measures, it is not clear that any businesses will be able to avoid the charges; therefore, many businesses will pass the costs on and ultimately they will result in higher prices for goods and services. (Some avoidance can be gained through conversion to alternative fuels). Higher prices will result in lower demand for goods and services which will have a dampening effect on employment. The magnitude of this effect has not been determined.
- o The expanded transit system will need more workers for operation and maintenance, as well as expanded management capability. Transit related jobs are projected to increase about 2,880. In addition, it is estimated that construction employment for expansion of transit and freeway systems will amount to 25,000 jobs per year over the next ten years.
- o Thus, in terms of quantifiable employment impacts, the CAP is likely overall to have a positive effect on employment. In addition to the net increase of 1,800 permanent jobs induced by the CAP, a net increase of 1,970 additional jobs would occur through multiplier effects. The 25,000 construction jobs would induce 41,250 additional jobs in other sectors.

Alternatives

- o The NO PROJECT alternative would not impose costs to business, consumers and local government for compliance with CAP control measures. The CAP's costs would be significant but in no case have they been determined to be unduly burdensome on any segment of the population or business community. The NO PROJECT alternative would not achieve any of the social and economic benefits of the CAP including increased worker health and productivity, improved transportation conditions with associated savings in travel costs, or increased employment from construction and operation of an expanded transportation system.
- o The ACCELERATED MARKET-BASED TCMs alternative could impose significant adverse economic effects in the region by substantially increasing transportation costs, especially for auto and truck use, without first providing sufficient transit alternatives. If the mobility improvements outlined in the CAP are not in place before the market-based TCMs are imposed, economically disadvantaged groups would be especially affected by the increased

costs. However, all business sectors would be adversely affected to some degree, with repercussions on workers and consumers.

- o The ROG measures affected by the ROG-FIRST CONTROL STRATEGY alternative represent about 10 percent of the total compliance costs and 20 percent of the adverse employment impacts of the stationary measures. Of these measures, the auto assembly rule (SCM A9) and the commercial charbroiling rule (SCM E3) carry the highest costs. The NOx rules, which would be shifted from Phase 1 to Phase 2, carry more than 85 percent of the total compliance costs. The net effect of this alternative on Bay Area businesses, then, would be to reduce Phase 1 costs by \$290 million per year.

2. OVERVIEW OF THE REGIONAL ECONOMY

The Bay Area enjoys a very strong economy, as exhibited by relatively high measures of income and low unemployment rates in comparison to California as a whole. During the last decade, however, the region has grown at a much slower rate in both population and employment than has the rest of the state. Regional employment growth has been much stronger than population and labor force growth, exacerbating problems of housing affordability and transportation congestion. These issues relate strongly to the overall business climate in the region. Business has had increasing difficulty recruiting qualified employees due to the high costs of housing and other living expenses compared to other parts of the nation. Due in part to these conditions, job centers have become more dispersed in the region and workers are increasingly commuting from counties outside the Bay Area.

The following section provides an overview of the regional economy, the growth projected for the region, and the planning issues that relate to the proposed CAP control measures. Chapter 4 provides more detailed information on the demographic characteristics of the region.

2.1 Economic Structure of the Region

The Bay Area achieved a moderate growth in jobs in the past decade. Following the effects of a nationwide recession in 1980-82, the region's economy recovered strongly in 1983-84, finally settling into a slower, but generally positive pace, for the remainder of the 1980s. Currently, it is estimated that Bay Area employers provide nearly 3.1 million jobs, representing an increase during the past decade of 538,125 jobs. The employment growth rate during the 1978 to 1988 period was 27.6 percent, lower than the 31.0 percent rate posted by the state as a whole (see Table 2).²

Well over half of the growth between 1980 and 1990 occurred in the retail trade and service industries, which together contributed just under 360,000 new jobs. Transportation services, instrument manufacturing, petroleum refining, and construction businesses also showed strong gains locally. The region's manufacturing and wholesale firms provided an additional 75,570 jobs during the 1980-1990 period.

² The 1990 figure and the discussion of 1980-1990 growth is taken from ABAG, *Projections 90*, while the State growth rate is based on 1978-1988 data as reported by the State Employment Development Department (EDD). The EDD data, which is shown in Table 2, is not comparable with ABAG data, but it provides a more detailed breakdown of employment by sector than can be obtained from ABAG.

TABLE 2
DETAILED EMPLOYMENT
GROWTH TRENDS IN CALIFORNIA AND THE BAY AREA 1978 - 1988

Industry	SIC	California		Percent Change	Bay Area		Percent Change
		1978	1988	1978-1988	1978	1988	1978-1988
TOTAL EMPLOYMENT		9,523,700	12,472,800	31.0%	2,262,000	2,886,700	27.6%
Agriculture		323,900	369,300	14.0%	24,500	21,900	-10.6%
Mining and Construction		454,600	685,600	50.8%	94,700	143,600	51.6%
Special Trade Contractors	17	218,800	374,600	71.2%	45,936	81,402	77.2%
Manufacturing //		1,875,200	2,149,200	14.6%	423,400	496,200	17.2%
Food and Kindred Products	20	182,300	175,700	-3.6%	48,100	40,200	-16.4%
Textile Mill Products	22	15,800	16,600	5.1%	819	1,047	27.7%
Lumber and Wood Products	24	69,500	69,200	-0.4%	5,771	6,515	12.9%
Furniture and Fixtures	25	55,000	62,000	12.7%	4,862	5,325	9.5%
Paper and Allied Products	26	37,700	40,700	8.0%	8,949	7,058	-21.1%
Printing and Publishing	27	112,400	161,500	43.7%	26,468	36,898	39.4%
Chemicals and Allied Products	28	62,900	73,200	16.4%	18,475	21,244	15.0%
Petroleum and Coal Products	29	27,000	27,800	3.0%	5,630	9,823	74.5%
Rubber/Miscellaneous Plastics	30	63,800	75,400	18.2%	7,038	7,901	12.3%
Stone, Clay and Glass Products	32	57,200	54,300	-5.1%	10,777	10,187	-5.5%
Primary Metal Industries	33	57,300	43,700	-23.7%	12,708	6,751	-46.9%
Fabricated Metal Products	34	147,500	138,700	-6.0%	30,678	20,723	-32.4%
Industrial Machinery, Equipment	35	202,800	219,300	8.1%	61,966	83,519	34.8%
Electronic Equipment	36	284,600	270,400	-5.0%	85,890	123,711	44.0%
Transportation Equipment	37	254,200	304,000	19.6%	41,872	40,411	-3.5%
Instruments/Related Products	38	80,400	247,700	208.1%	26,065	47,308	81.5%
Transportation and Public Utilities //		506,400	589,000	16.3%	152,000	163,400	7.5%
Passenger Transportation	41	24,831	27,307	10.0%	6,510	7,074	8.7%
Freight Transportation	42	113,700	148,100	30.3%	29,080	33,840	16.4%
Water Transportation	44	30,666	19,400	-36.7%	9,782	7,364	-24.7%
Transportation Services	47	26,677	48,860	83.2%	5,942	12,614	112.3%
Electric, Gas and Sanitary Services	49	67,600	85,600	26.6%	17,817	23,018	29.2%
Wholesale Trade		534,300	730,100	36.6%	125,900	166,000	31.9%
Retail Trade		1,591,700	2,144,300	34.7%	364,700	480,200	31.7%
Finance, Insurance, Real Estate		553,200	807,300	45.9%	164,100	211,400	28.8%
Services		1,931,300	3,104,100	60.7%	483,000	761,100	57.6%
Government		1,753,100	1,934,100	10.3%	429,700	442,900	3.1%

Source: Applied Development Economics, based on data in State Employment Development Department, Annual Planning Reports, 1990

Notes: // The table shows only selected 2-digit SIC codes, which do not sum to the sector sub-totals.

SIC refers to the Standard Industrial Classification System promulgated by the Federal Office of Management and Budget

In spite of an industry recession in 1985-87, growth in the region's high-tech industries, including electronics, computers, and office, research and systems control equipment has outpaced other manufacturing industries. ABAG estimates that in 1990 high-tech industries provided about 54 percent of the region's manufacturing jobs, compared to 48 percent in 1980. Primary metals manufacturers, on the other hand, lost nearly half of their employees between 1978 and 1988, and fabricated metal products manufacturers cut employment by nearly a third. Other sectors losing employment in the past ten years include agriculture, food products, paper products, stone, clay and glass manufacturing, transportation equipment manufacturing and water transportation services. (see Table 2).

In the Bay Area, Santa Clara, San Francisco and Alameda counties historically have been major sources of regional employment, providing just under 70 percent of all jobs in 1980. This pattern of concentration appears to have shifted somewhat in the past decade, with Alameda and San Francisco counties declining in their relative shares of regional employment. Santa Clara County continued to grow substantially, but in general job centers are becoming more dispersed. Additional centers of job growth include Contra Costa County, where jobs registered a 45 percent, or 91,500-job, increase by the end of the decade, and San Mateo County, with a 17 percent, or 45,000-job increase. In contrast, although San Francisco remains a center of employment, job growth in this county has been relatively modest (estimated at 4.8 percent from 1980 to 1990).

The Bay Area's unemployment rate in 1988 was 4.2 percent, lower than in the remainder of California (5.3 percent).³ Solano (5.9 percent), Sonoma (4.7 percent), Napa (4.6 percent), Contra Costa (4.6 percent) and San Francisco (4.5 percent) all have higher unemployment rates than the regional average. Only Solano County's unemployment is higher than California's rate. Santa Clara (3.9 percent), Marin (3.0 percent), and San Mateo (2.8 percent) all have a lower unemployment rate than the regional average.

Employment by Business Sector

Table 2 provides a detailed comparison of regional and state employment data. The services sector is the largest employer in the Bay Area, as is true for the state as a whole. Service businesses include personal services such as hair dressers, laundries and shoe repair shops, as well as business services such as computer processing, cleaning and maintenance services, and professional services such as accountants, lawyers and doctors. Such businesses provide nearly one-quarter of the jobs in the region. Manufacturing firms provide about 17 percent of total jobs, while retail businesses

³ State Employment Development Department, Annual Planning Information Reports, Sacramento, 1990.

employ slightly fewer workers (16.6 percent). Government is the fourth largest major sector in the region with about 15 percent of all employment.

About 25 percent of Bay Area manufacturing employment is in the electronic machinery sector, with another 9.5 percent in instrument manufacturing. Other high technology jobs are distributed in the industrial machinery sector (SIC 35) and in research and development activities in other manufacturing firms. Interestingly, between 1978 and 1988, electronics firms statewide suffered a net reduction of five percent of employment, while similar firms in the Bay Area posted a 44 percent employment increase. However, in recent years these industries have experienced difficulties in the Bay Area as well. The period of employment growth in these industries really concluded in 1985. Between 1985 and 1988, high technology industries lost nearly 10,000 jobs.⁴ The shakeout in this sector has continued to the present, although firms with highly specialized product niches continue to do well.

Transportation equipment manufacturing and other industrial machinery are also strong sectors in the region. Other sectors in which the Bay Area has a relatively high share of statewide employment include chemicals manufacturing and petroleum refining. Both of these industries would be directly affected by the CAP control measures. Construction firms employ about five percent of Bay Area workers.

2.2 Projected Growth in the San Francisco Bay Region

In general, growth in the San Francisco Bay Region is expected to proceed at a slower pace in the 1990-2005 period than in the preceding decade. Although still positive, projected average annual growth rates for population, labor force and jobs are all expected to be below those experienced between 1980 and 1990. Population growth during the last decade actually exceeded the regional projections. The 1990 census figure of 6,023,577 is more than 72,600 people over the 1990 ABAG projection. Consequently, some caution is necessary in interpreting the current ABAG projections, summarized in Table 3, until ABAG has completed new projections incorporating the 1990 census. The projections discussed below probably indicate the relative growth shares of the various counties, rather than the actual growth that will occur.

The Bay Area is projected to add another 856,100 residents by 2005. Although substantial in absolute terms, this increase translates into an annual increase of only about one percent. Household growth will also gradually slow from the projected 1980-1990 rate of 1.6 percent per year to 1.2

⁴ Raymond J. Brady, The Bay Area Economy: Shifting Structure and Growth, ABAG, Working Paper 89-1, June 1989, p. 6.

TABLE 3

SAN FRANCISCO REGIONAL HOUSEHOLD AND EMPLOYMENT PROJECTIONS

	1980	1990	2005	Change				Annualized Rate of Growth(%)	
				1980-90		1990-2005		1980-90	1990-2005
				Number	Percent	Number	Percent		
<u>Household Population</u>									
Region Total	5,058,620	5,800,850	6,656,950	742,230	14.7	856,100	14.8	1.5	1.0
Alameda	1,077,339	1,232,900	1,397,100	155,561	14.4	164,200	13.3	1.4	0.9
Contra Costa	656,380	790,000	946,900	133,620	20.2	154,750	19.8	2.0	1.3
Marin	215,273	224,750	248,750	9,477	4.4	24,000	10.7	0.4	0.7
Napa	93,361	103,450	120,650	10,089	10.8	17,200	16.6	1.1	1.1
San Francisco	654,511	714,500	746,400	59,989	9.2	31,900	4.5	0.9	0.3
San Mateo	580,517	629,050	672,700	48,533	8.4	43,650	6.9	0.8	0.5
Santa Clara	1,267,673	1,432,000	1,620,550	164,327	13.0	188,550	13.2	1.3	0.9
Solano	235,203	326,200	455,400	90,997	38.0	127,600	41.0	3.7	2.7
Sonoma	293,396	372,350	476,600	78,954	26.9	104,250	28.0	2.7	1.9
<u>Households</u>									
Region Total	1,970,551	2,284,080	2,706,200	313,529	15.9	422,120	18.5	1.6	1.2
Alameda	426,093	491,610	572,420	65,517	15.4	80,810	16.4	1.5	1.1
Contra Costa	241,534	303,690	380,790	62,156	25.7	77,100	25.4	2.6	1.7
Marin	88,723	98,320	112,900	9,597	10.8	14,580	14.8	1.1	1.0
Napa	36,624	42,220	52,500	5,596	15.3	10,280	24.3	1.5	1.6
San Francisco	298,956	314,400	334,700	15,444	5.2	20,300	6.5	0.5	0.4
San Mateo	225,201	245,530	274,020	20,329	9.0	28,490	11.6	0.9	0.8
Santa Clara	458,519	525,900	617,490	67,381	14.7	91,590	17.4	1.5	1.2
Solano	80,426	112,710	162,880	32,284	40.1	50,170	44.5	4.0	3.0
Sonoma	114,475	149,700	198,500	35,225	30.8	48,800	32.6	3.1	2.2
<u>Labor Force</u>									
Region Total	2,691,576	3,276,700	3,891,500	585,124	21.7	614,800	15.8	2.2	1.2
Alameda	560,253	671,400	789,700	111,147	19.8	118,300	17.6	2.0	1.1
Contra Costa	323,456	424,700	533,000	101,244	31.3	108,300	25.5	3.1	1.7
Marin	123,394	139,000	157,300	15,606	12.6	18,300	13.2	1.3	0.9
Napa	45,710	55,200	68,800	9,490	20.8	13,600	24.6	2.1	1.6
San Francisco	371,194	418,100	437,400	46,906	12.6	19,300	4.6	1.3	0.3
San Mateo	322,897	365,700	399,400	42,803	13.3	33,700	9.2	1.3	0.6
Santa Clara	692,319	844,800	982,600	152,481	22.0	137,800	16.3	2.2	1.1
Solano	111,371	161,600	239,600	50,229	45.1	78,000	48.3	4.5	2.7
Sonoma	140,982	196,100	263,700	55,118	39.1	67,600	34.5	3.9	2.3

TABLE 3 (Continued)
SAN FRANCISCO REGIONAL HOUSEHOLD AND EMPLOYMENT PROJECTIONS

	1980	1990	2005	Change				Annualized Rate of Growth(%)	
				1980-90		1990-2005		1980-90	1990-2005
				Number	Percent	Number	Percent		
<u>Employed Residents</u>									
Region Total	2,552,894	3,162,800	3,751,600	609,906	23.9	588,800	18.6	2.4	1.2
Alameda	522,069	647,500	778,900	125,431	24.0	131,400	20.3	2.4	1.4
Contra Costa	307,476	407,800	512,600	100,324	32.6	104,800	25.7	3.3	1.7
Marin	118,560	135,200	154,600	16,640	14.0	19,400	14.3	1.4	1.0
Napa	43,197	52,900	67,200	9,703	22.5	14,300	27.0	2.2	1.8
San Francisco	347,091	402,400	418,400	55,309	15.9	16,000	4.0	1.6	0.3
San Mateo	314,242	358,000	387,200	43,758	13.9	29,200	8.2	1.4	0.5
Santa Clara	666,510	815,900	950,700	149,390	22.4	134,800	16.5	2.2	1.1
Solano	102,626	154,000	228,500	51,374	50.1	74,500	48.4	5.0	3.2
Sonoma	131,123	189,100	253,500	57,977	44.2	64,400	34.1	4.4	2.3
<u>Total Jobs</u>									
Region Total	2,535,155	3,073,280	3,954,160	538,125	21.2	880,880	28.7	2.1	1.9
Alameda	511,133	608,480	783,350	97,347	19.0	174,870	28.7	1.9	1.9
Contra Costa	201,237	292,700	389,440	91,463	45.5	96,740	33.1	4.5	2.2
Marin	77,853	99,950	132,660	22,097	28.4	32,710	32.7	2.8	2.2
Napa	35,870	47,100	65,530	11,230	31.3	18,430	39.1	3.1	2.6
San Francisco	552,200	578,920	671,940	26,720	4.8	93,020	16.1	0.5	1.1
San Mateo	259,795	303,600	378,850	43,805	16.9	75,250	24.8	1.7	1.7
Santa Clara	702,922	881,710	1,145,950	178,788	25.4	264,240	30.0	2.5	2.0
Solano	90,789	120,230	181,440	29,441	32.4	61,210	50.9	3.2	3.4
Sonoma	103,356	140,590	205,000	37,234	36.0	64,410	45.8	3.6	3.1

Sources: The projection figures are obtained from ABAG, Projections 90. All percentages calculated by Applied Development Economics.

percent per year between 1990-2005. Within the Bay Area, five counties are projected to produce a 1990-2005 population growth in excess of 100,000. These counties are Santa Clara (+188,550), Alameda (+164,200), Contra Costa (+154,750), Solano (+127,600), and Sonoma (+104,250).

The projections indicate that employers in the region will provide an additional 880,880 jobs, reaching a total of 3,954,160 by 2005. Again, although this represents substantial growth, it is below the rate of growth in 1980-1990. From 1980 to 1990, the number of Bay Area jobs increased at an annual rate of 2.1 percent, compared to 1.9 percent forecasted from 1990 to 2005. Major sources of anticipated growth through 2005 include the service industries (+368,180 jobs), retail trade (+175,420), and manufacturing (+162,330). Within the manufacturing sector, high-tech industries are expected to be the major source of additional growth, providing about 77 percent of all new manufacturing jobs during the next 15 years. By 2005, these industries will provide 60 percent of all Bay Area manufacturing jobs.

Projected job growth through 2005 is heavily concentrated in Alameda (+174,870) and Santa Clara (+264,240) counties. Together, these two counties are expected to produce about half of the region's total job expansion between 1990 and 2005.

2.3 Labor Force and Jobs/Housing Balance Issues

ABAG projection data indicates that in 1990 there were 3,276,700 persons in the regional labor force, of which 3,162,800 were employed. This suggests that some 113,900 people, or 3.5 percent of the labor force, were unemployed. This is below the State Employment Development Department estimate of over 4.2 percent for 1988 as discussed above. At the same time, the region provided 3,073,280 jobs, implying that a net total of 89,520 Bay Area workers were commuting outside the region to work. This situation is projected to change dramatically over the next fifteen years. Due to changes in the labor force participation rate (that is, the percentage of persons working between the ages of 15 and 65 who are actually employed or seeking work), and the decreasing availability of sites for new housing development, the predominant trend is projected to see substantial commuting into the Bay Area. Despite the current overall net export of regional labor, in-bound commuting has already increased dramatically due to the lack of affordable housing in proximity to regional job centers. Within the region, significant imbalances between labor force and jobs exist, creating long commutes and attendant traffic congestion and air pollution.

From a planning perspective, it is ideal to have a reasonable match between the size of the employed labor force and the number of jobs available within the major cities in the region. Although the normal diversity in individual residential and job preference will mean that some workers will always

choose to work away from their town of residence, a reasonable balance permits workers who wish to reduce their commute (and lessen their contribution to regional traffic congestion) the option to do so. Since the opportunity to live near one's workplace is closely tied to the availability of housing opportunities, this issue is frequently expressed in terms of jobs/housing ratios; however, it is important to note that a 1:1 correspondence between housing units and jobs in a community is not the desired balance, because frequently more than one worker resides in a house. On the average in the Bay Area, in fact, there are 1.4 workers per household. On this basis, then, the ideal balance would be 1.4 jobs per housing unit. ABAG has further refined this notion for its fair share housing needs analysis to reflect existing land use patterns, so that a 1:1 correspondence between jobs and workers is not required in each community.

As mentioned, the supply of labor in the region is projected to decrease markedly in relation to the projected job growth over the next fifteen years. ABAG projects that the labor force participation rate will begin to level off due to aging in the regional population. It is estimated that the participation rate will level off at about 71 percent, up from the current figure of 69.3 percent, and then decline. At the same time, a basic imbalance in development potential between residential and non-residential land uses suggests that the labor supply may not keep up with job growth. Over the next 15 years, the region's labor force is expected to grow by 614,800 individuals, while the number of jobs is expected to increase by 880,880. By 2005, the number of jobs is projected to exceed the size of the labor force in the entire region, and the total employment provided by region employers is expected to exceed the number of employed residents by 202,560 jobs. This situation has already led to substantial commuting from counties outside the Bay Area, including Santa Cruz, San Joaquin, and the Sacramento area.

ABAG suggests that this trend will have adverse impacts on business, but may have certain positive impacts for workers retaining jobs in the region:

"As labor supply growth slows or stops, labor costs will be affected, if demand remains fixed. If trends continue, the 1990s in the Bay Area probably will be characterized by labor shortages causing inflationary pressures on wage and salary compensation which will affect long term job growth... Furthermore, if the economy remains strong, slower labor force growth could result in higher productivity and a strengthening of real income."⁵

⁵ Ibid., p. 10.

3. IMPACTS TO BUSINESS AND INDUSTRY

3.1 Impacts of Transportation Control Measures

Employer-Based Trip Reduction Measures

It is likely that these measures will affect a broad segment of businesses in the region, although the specific requirements will be developed through the District's formal rule-making process. For the purposes of the economic analysis, it is assumed that all firms of 50 or more employees would participate, meaning that three-fourths of the regional workforce, or about 3,000,000 workers, would be affected by 2005. Employers would be required to either: a) develop and implement a trip reduction plan to achieve an average vehicle ridership (AVR) of between 1.3 and 2.0, depending on location, resulting in a regional average of 1.5 AVR for work trips, or b) charge employees for parking (\$3.00/day) and use the revenues to provide financial incentives for employees to rideshare or take transit. In Phase 1 the employee parking fee is optional; however, in Phase 3 the charges would become mandatory.

These measures would result in the employment of transportation coordinators among private employers. It is estimated that the program could cost the private sector \$150 million or more per year (1991 dollars).⁶ This assumes an average cost of about \$50 per employee including costs for accounting, explanatory materials, etc., in addition to the transportation coordinators. The costs could be much higher depending on the level of financial incentives employers offer to their workforces for transit usage and other trip reduction measures.

The potential revenues from parking charges would far exceed this amount, even after any rebates to economically disadvantaged employees, for those employers who would choose to levy the charges in Phase 1. Employers who implement trip reduction programs without imposing the parking charges would experience costs as discussed above. Smaller employers may be more adversely affected since they have fewer employees to help share the program costs.

⁶ Regarding the cost impacts of the TCMs, this report relies heavily on work prepared by Dr. Greig Harvey of Deakin/Harvey/Skabardonis, Inc. (DHS). The cost and travel time benefit estimates attributed to DHS, Inc. are drawn from Cost Assumptions for State Transportation Measures, May 24, 1991, unpublished.

In Phase 3, the cost impacts of these measures would be completely shifted from employers to those commuters unable to shift their travel patterns to avoid the daily parking charges. This is discussed further in the next chapter.

Mobility Improvements

Mobility measures should have largely positive effects on business. Although the transportation improvements most directly affect commuter trips, the reduced congestion would have the side effect of reducing costs of goods transportation. It is estimated that 9 percent of vehicle miles traveled in the region is for commercial purposes. The cost savings for reduced travel times for business are projected by Deakin/Harvey/Skabardonis, Inc. to reach \$26.3 million per year at the completion of CAP Phase 2 improvements. The Phase 2 measures are to be funded through several local revenue measures, in addition to state legislated funding programs. The local measures include raising bridge tolls to \$2.00, adding \$4.00 to vehicle registration fees, and increasing the gas tax to \$0.14 per gallon. The combined business expense from these measures is estimated at \$22.3 million per year.

Businesses most affected by improved freeway and road operations are those in the transportation and distribution sectors. Employment in these sectors was estimated to be 188,000, or 6.5 percent of Bay Area employment, in 1988.⁷ However, most all businesses, including manufacturing as well as service firms, are dependent on road transportation for delivery of supplies, products, and customers. For example, MTC estimates that the improved mobility projected in the RTP will increase sales and employment in retail and service business by 17 percent, resulting in nearly 14,000 new jobs.⁸ This kind of effect, though is dependent on the ability of consumers and businesses to adjust to transit-based travel patterns. A major thrust of the CAP is to reduce auto vehicle trips and miles traveled. This would benefit businesses that must move goods and services on the highways. However, some businesses dependent on customers using the highways may find that the benefits of less traffic congestion are outweighed during Phase 3 by the increased costs of vehicle use.

Other benefits to industry and employment include the construction and operation of the expanded transportation system. It is estimated that expenditures to implement the mobility improvements will

⁷ Based on State Employment Development Department data. Includes motor freight transportation and warehousing, transportation services and wholesale trade.

⁸ MTC, Draft EIR Regional Transportation Plan p. 15.35.

create some 250,000 person years of employment in construction industries.⁹ A ten year construction schedule would generate an average of 25,000 new jobs per year during that period.

Expanded bus and rail transit operations will provide new jobs for vehicle operators, maintenance workers and administrative personnel. The Regional Transportation Plan projects that regional transit ridership will increase more than 40 percent by the year 2010 as a result of the program of improvements. The Phase 3 measures in the CAP are likely to boost this figure further by imposing disincentives to auto use along with the transit incentives included in Phase 2. The effect of this expanded service on employment will vary with each transit agency depending on their current growth capacity and operational considerations. It is estimated that the overall regional increase in employment in these agencies would reach 40 percent of current employment, resulting in 2,880 additional jobs for transit operation and maintenance.

Market-Based Measures

Phase 2 and Phase 3 of the CAP include a number of revenue measures which counteract, or at least shape in new ways, the positive economic effects of the mobility improvements. It is suggested above, for example, that the improved mobility on the road system may not entirely benefit firms whose customer base is heavily dependent upon continued auto use. In Phase 2, the revenue measures are included for implementation support; that is, to help pay for the regional transportation improvements. The mission of the Phase 3 market-based measures, however, extends beyond funding of specific projects, addressing a more general goal of reducing auto use to achieve ambient air quality standards. A further element of this goal is to balance the externalities of extensive dependence on auto-based travel patterns.

The potential cost impacts of the market-based TCMs, which include increasing registration fees to account for total air pollution emitted by each vehicle, requiring drivers who use congested corridors during peak periods to pay extra fees, eliminating all free parking, and increasing the gas tax to \$2.00 per gallon, are substantial. It is estimated that the total out-of-pocket expenses within the region would be more than \$3.3 billion per year, of which the business sector would pay about \$332.4 million annually. The highway travel time benefits to business of the market-based measures

⁹ This estimate is based on an employment factor of 25.8 construction jobs per \$1 million in expenditures, following the methodology used by Cambridge Systematics, Inc. in: MTC, Draft EIR Regional Transportation Plan, April 1991, p. 15.27. The calculation is applied only to transit projects included in the CAP. The highway related projects also included in the CAP, such as HOV facilities, would increase construction employment further.

are estimated at \$112 million per year.¹⁰

The costs of these measures should be considered "transfers" of funds within society. That is, the revenues generated by these measures do not represent additional costs to society as a whole, but rather they transfer funds primarily from auto-dependent drivers to those willing and able to increase their use of transit, providing benefits in terms of improved air quality and the multitude of specific quality of life improvements that entails. Such benefits include reduced health costs and increased worker productivity, increased overall mobility in the region due to the expanded transit system, and higher amenity values which improve the quality of life the region can offer. All Bay Area businesses and residents share in the benefits; however, those who are unable to avoid extensive automobile use would pay a higher proportion of the costs.

Just as the mobility improvements will affect most all businesses, at least indirectly, so too will the market-based TCMs affect the economy in a broad manner. It will be difficult for the transportation-related firms that will be affected directly to avoid many of the charges, although the gas tax could be avoided by converting to alternate fuels, as proposed in another measure. If the charges are imposed broadly in the transportation sector, it will be easier for these firms to pass the costs on to consumers because lower priced alternatives will not be available. The higher transportation costs would result in higher prices for final products. Firms that are primarily export-based will be hurt in the national and world-wide markets. Locally-consumed products and services may also experience reduced demand depending on their price elasticities. This would reduce business growth and lead to lower job growth than might otherwise be attained, not considering the economic benefits of improved mobility.

Over the longer term, many of these economic impacts will become less significant as the economy adjusts to increased use of alternatives to the single occupancy vehicle. It is difficult to predict how the economy will respond to the reduced air pollution, traffic congestion, and dispersed land use patterns. However, by phasing the overall program to implement substantial mobility improvements before imposing the costs of the market-based TCMs, the CAP provides the economy the opportunity to make these transitions in a flexible and gradual process.

Indirect Source Control Measures

Phase 1 of the CAP includes an indirect source control rule that could affect the cost to business of locating in certain communities or in certain kinds of developments. The specific measures that

¹⁰ Deakin/Harvey/Skabardonis, Inc., op cit.

might be applied to implement the rule include a variety of site design and amenity approaches that would increase the cost of development and construction of new buildings (e.g. improved pedestrian access, transit shelters and bicycle amenities). This may have an inflationary effect on building lease costs.

In the short term, the current oversupply of developed commercial properties would cushion this effect. Over the long term, the regional surplus of non-residential land would also dampen adverse impacts. ABAG projects a general shortage of housing in the region compared to the potential for job growth. This job growth projection is based on regional market forces and economic demand generated through local, statewide and national economy. The economic demand is projected to use only a fraction of the land zoned for commercial uses. On the other hand, housing development is severely constrained by the availability of suitable sites. Indeed, in order to meet the ABAG job growth projections, it will be necessary for areas outside the region, including Santa Cruz, Yolo, San Joaquin and other counties to absorb substantial housing demand to support a sufficient labor force for the Bay Area. The upshot of this situation is that any inflationary effects of the indirect source review rule on business locations would be mitigated by the surplus availability of sites in the region.

Impacts Related to Motor Vehicle Control Measures

A potentially major cost could be imposed on certain businesses by, Measure H3, the "Requirement for Clean Vehicles in Fleets" rule. The affected emissions source categories under this rule would be light duty passenger vehicles and light and medium duty trucks. Heavy truck operators would not be affected. In southern California, it is estimated that 12 percent of the total vehicle population is owned by affected fleet operators.¹¹ This industry sector appears to be dominated by a few large operators; however, numerous very small operators exist. The costs of this measure have not been quantified; however, it is likely that efficiencies of scale in the conversion or manufacture of the vehicles or fuel systems will benefit the large operators to the detriment of smaller firms with fewer vehicles. As discussed above, however, the market-based TCMs' increasing gasoline taxes may be sufficient to induce some fleet operators to convert to other fuels.

3.2 Impacts of Stationary Source Control Measures

The CAP contains 54 proposed stationary source control measures which are intended to improve air quality and lower pollution by reducing emissions of carbon monoxide, reactive hydrocarbons, and

¹¹ Bay Area Air Quality Management District, Bay Area 1991 Clean Air Plan Control Measure Descriptions, Draft June 25, 1991.

nitrogen oxides. Affected source categories include: surface coatings, adhesives and solvents used by industry and households; petroleum and organic liquid storage and distribution; refinery and chemical plant processes; combustion of fuels; and other industrial and commercial processes. In general, these measures would require industry to lower emissions by installing pollution abatement equipment, altering their production processes, and/or using lower-emitting materials in the production of goods and services. Additional proposals concern postponement of selected industrial and household pollution-generating activities on forecast "high pollution" days.

Compliance Costs - Stationary Control Measures

The purpose of this section is to assess the combined impact of the proposed control measures on Bay Area industries and employment. As the first step in this process, annual compliance costs for each measure were calculated based on data and information provided by BAAQMD. This data includes the anticipated emission reductions resulting from adoption of each measure, as well as the estimated cost per ton of reduced emissions. Compliance cost estimates represent an annual average for the industry and include increased expenditures for operations and maintenance, as well as amortized capital costs.

Compliance cost estimates were prepared only for those measures for which both cost and emission reduction data were available (35 of 54 proposed measures). Two additional measures are expected to result in unidentified industry savings. Costs for the remaining measures could not be estimated with existing information. Where appropriate, qualitative assessments of the potential impacts of the latter measures have been incorporated into the analysis. However, as a result of the lack of quantitative information for these measures, it must be recognized that total compliance costs for impacted industries are underestimated by an unknown amount.

Table 4 lists all the proposed stationary control measures (SCMs) together with estimates of the minimum and maximum industry compliance costs associated with each measure. Assuming full implementation without regard to phasing, the combined, known compliance cost for all measures is estimated to range from a minimum of \$292.1 million to a maximum of \$339.8 million per year (1991 dollars). As indicated previously, these estimates include operating and maintenance costs, as well as amortized capital expenditures.

Approximately three-fourths of total SCM compliance costs are associated with six measures designed to reduce NO_x emissions from the combustion of fuels. Measures to reduce air pollution from refinery, chemical and other industrial and commercial production processes account for 13 to 16 percent of known industry compliance costs, while an additional eight percent results from

TABLE 4

ESTIMATED COSTS OF PROPOSED STATIONARY CONTROL MEASURES

SURFACE COATING AND SOLVENT USE							
No.	Control Measures	Implem. Date	Cost per Ton of Reduced Emissions	Average Emissions Reductions (tons/day)		Estimated Annual Cost (1991 dollars)	
				Min.	Max.	Minimum	Maximum
A1	Arch. Coatings (lower VOC limits)	1995	\$2,000	0.86	1.19	\$627,800	\$868,700
A2	Improved Industrial Coatings	2000	\$2,000	0.58	0.88	\$423,400	\$642,400
A3	Aerospace/ Aircraft Coatings	1995	\$2,000	0.30	0.42	\$219,000	\$306,600
A4	Wood Furniture/Cabinet Coatings	1991	\$2,000	5.75	6.48	Adopted	Adopted
A5	Misc. Metal Parts, Products	1995	\$2,000	0.26	0.35	\$189,800	\$255,500
A6	Plastic Parts, Products	1995	\$2,000	0.32	0.42	\$233,600	\$306,600
A7	Improved Can/Coil Coatings	1996	\$2,000	0.35	0.70	\$255,500	\$511,000
A8	Magnetic Wire Coatings	1997	\$2,000	0.11	0.14	\$80,300	\$102,200
A9	Auto Assembly/Coating	2000	\$21,000	0.60	0.90	\$4,599,000	\$6,898,500
A10	Gen. Solvent/Surface Coatings	1994	\$2,000	0.22	0.33	\$160,600	\$240,900
A11	Adhesives	1992	\$2,000	1.85	2.12	\$1,350,500	\$1,547,600
A12	Elim. Rules: Alternatives	1991	\$2,000	0.16	0.32	\$116,800	\$233,600
A13	Graphic Arts Printing	1994	\$2,000	0.09	0.13	\$65,700	\$94,900
A14	Ink Manufacturing	1998	\$6,000	0.22	0.35	\$481,800	\$766,500
A15	Resin Manufacturing	2000	unknown	unk	unk	unknown	unknown
A16	Semiconductor Manufacturing	1999	\$4,000	0.08	0.09	\$116,800	\$131,400
A17	Household Solvents Disposal	1998	unknown	0.21	0.21	unknown	unknown
A18	Lower VOC Solvents/Coatings	1996	\$1,100	6.90	10.30	\$2,770,350	\$4,135,450
A19	Ultra-Low Voc Coatings	2000	unknown	19.80	20.90	unknown	unknown
Subtotal - Coatings/Solvents						\$11,690,950	\$17,041,850
FUELS/ORGANIC LIQUID STOR./DISTRIB.							
B1	Railcar Loading	1999	\$4,000	0.08	0.08	\$116,800	\$116,800
B2	Organic Liquid Storage	1992	\$2,000	1.07	1.29	\$781,100	\$941,700
B3	Organ. Chem. Terminals/Bulk Plants	1994	savings	0.16 *	0.24	savings	savings
B4	Gas Delivery Vehicles	1996	savings	0.05	0.07	savings	savings
B5	Marine Vessel Tank Purging	1994	\$4,200	0.40	0.43	\$613,200	\$659,190
B6	Cleanup Organic Liquids	1999	\$42,000	0.07	0.07	\$1,073,100	\$1,073,100
B7	Propane Handling	2000	unknown	0.13	0.14	unknown	unknown
Subtotal - Fuels, Organic Liquids						\$2,584,200	\$2,790,790
REFINERY/CHEMICAL PLANT PROCESSES							
C1	Pressure Relief Valves	1994	\$10,000	0.50	0.67	\$1,825,000	\$2,445,500
C2	Pump & Compressor Seals	1992	\$2,000	1.04	1.15	\$759,200	\$839,500
C3	Valves & Flanges	1992	\$1,000	2.51	3.41	\$916,150	\$1,244,650
C4	Vacuum/Depressurization Systems	1999	\$1,000	0.04	0.09	\$14,600	\$32,850
C5	Wastewater Separators	1998	\$1-3,000	2.49	2.62	\$908,850	\$2,868,900
C6	Refinery Wastewater Treatment	1991	\$10,000	1.76	1.86	\$6,424,000	\$6,789,000
C7	Petroleum Refinery Flares	1999	unknown	0.26	0.26	unknown	unknown
Subtotal - Refineries/Chem. Plants						\$10,847,800	\$14,220,400

TABLE 4 (Continued)

ESTIMATED COSTS OF PROPOSED STATIONARY CONTROL MEASURES

ESTIMATED COSTS OF PROPOSED CONTROLS FOR CASE NUMBER 1						
No. Control Measures	Implem. Date	Cost per Ton of Reduced Emissions	Average Emissions Reductions (tons/day)		Estimated Annual Cost (1991 dollars)	
			Min.	Max.	Minimum	Maximum
COMBUSTION OF FUELS (NOx)						
D1 Non-Util. Int. Comb. Engines	1991	\$9,300	6.03	7.53 *	\$20,468,830	\$25,560,580
D2 Stationary Gas Turbines	1991	12,000	6.02	6.36 *	\$26,367,600	\$27,856,800
D3 Elec. Generating Boiler	1991	\$14,000	13.55	15.55 *	\$69,240,500	\$79,460,500
D4 Boilers, Generators, Heaters	1991	\$10,000	36.37	41.5 *	\$132,750,500	\$157,475,000
D5 Cement Plant Kilns	2000	\$2,000	2.68	3.22 *	\$1,956,400	\$2,350,600
D6 Glass Melting Furnaces	1991	\$4,000	2.33	2.88 *	\$3,401,800	\$4,204,800
D7 Control of Emiss/Resid water Htg	1991	\$1,600	0.32	0.48 *	\$186,880	\$280,320
Subtotal - Fuels Combustion					\$254,372,510	\$291,188,600
OTHER INDUSTRIAL/COMMERCIAL PROC.						
E1 Rubber Products Mfg./Emissions	1999	\$6,000	0.40	0.60	\$876,000	\$1,314,000
E3 Commercial Charbroilers	2000	\$25,000	1.29	1.45	\$11,771,250	\$13,231,250
Subtotal - Other Indus./Commercial					\$12,647,250	\$14,545,250
OTHER STATIONARY CONTROL MEASURES						
F1 Improve New Source Review	1991	unknown	1.14	1.14	unknown	unknown
			0.53	0.53 *		
F2 Minimization Mgmt. Plan (contingency)	2000	unknown	unk	unk	unknown	unknown
F3 Promote Energy Efficiency	1992	unknown	unk	unk	unknown	unknown
F4 Enforcement of Dist. Regs.	1995	unknown	unk	unk	unknown	unknown
Subtotal - Other SCMs					unknown	unknown
INTERMITTENT CONTROL MEASURES						
G1 Cit. Postpone. Discret. Activ.	1992	\$0	0.24	0.48	\$0	\$0
			0.02	0.04 *		
G2 Indus. Postponement of Activity	1993	unknown	0.19	0.21	unknown	unknown
Subtotal - Intermittent SCMs					unknown	unknown
TOTAL ESTIMATED COSTS - ALL PROPOSALS					\$292,142,720	\$339,785,900

Source: Applied Development Economics, based on data provided by the BAAQMD.

Notes:

Cost-effectiveness per ton of reduced emissions is the average for all sources affected by the control measure.

Average emissions represent the average daily anticipated reduction in emissions likely to result from implementation of the proposed measure.

The figures in the table differ from those in the CAP, which represent summer day emissions reductions.

Implementation date is the initial date of implementation for all or any component of the proposed measure.

An asterisk (*) indicates data is for NO_x emissions. All other data represent ROG emissions.

Intermittent Control Measures and Motor Vehicle Measures are effective only on ozone excess days (approximately 20 days/year).

measures affecting the use of surface coatings and solvents. Measures to control emissions from the distribution and storage of fuels and organic liquids contribute less than two percent of total industry costs, while costs associated with proposals for intermittent control measures, improved new source review, emission minimization management plans, and improved enforcement of existing rules are largely unknown.

Economic Impact of Proposed SCMs

Based on interviews and additional information provided by BAAQMD, industries likely to be directly and significantly impacted by each proposed SCM were identified. The estimated maximum and minimum compliance costs associated with each measure were then allocated among the affected industries. Criteria used to allocate costs include: the relative share of emissions produced by each industry; industry employment; and BAAQMD staff experience. The information and data were then reorganized by industry to provide: a list of the proposed SCMs expected to affect each industrial sector; known costs of compliance for the industry resulting from each SCM; a list of SCMs affecting the industry for which compliance costs are not known; and aggregate industry compliance costs resulting from implementation of all proposed SCMs.

Table 5 identifies the aggregate compliance costs imposed on 24 individual industries likely to be directly impacted by the proposed SCMs. Focusing on the maximum cost case, current estimates indicate that implementation of the proposed SCMs will result in annual average costs to the manufacturing sector of \$208.4 million (1991 dollars). An additional \$115.4 million, or 34 percent, of total compliance costs will fall on the public utility sector (electric, gas and sanitary services), with the remaining \$16 million spread among the transportation, trade and service sectors. Known compliance costs for all affected industries represent 0.33 percent of the total value of output for these sectors (Table 6). Given the small share of output represented by increased compliance costs, implementation of the SCMs alone is not expected to have a substantial impact on the overall Bay Area economy.

General Industry Impacts

Although the overall impact will not be dramatic, the SCMs will have a marginal effect on the region's economy and on specific industries within the region. In general, the proposed SCMs require manufacturing firms and selected segments of the public utility, trade, service, and transportation industries to undertake additional capital and operating expenditures in order to reduce emissions and improve the region's air quality. Based on current information, it does not appear that implementation of the SCMs will require firms to hire significant numbers of additional employees.

TABLE 5

ESTIMATED DIRECT COMPLIANCE COSTS BY INDUSTRY

SIC	Industry	Annual Estimated Compliance Costs For Proposed SCMs /1/ (1991 \$)	
		Minimum	Maximum
0	General Impacts/Manufacturing	\$88,116,450	\$102,110,470
17	Construction	\$1,852,340	\$2,347,090
22	Textile Mill Products /2/	unknown	unknown
25	Furniture and Fixtures /2/	unknown	unknown
26	Paper and Allied Products /2/	unknown	unknown
27	Printing and Publishing	\$508,060	\$770,170
28	Chemicals/Allied Products	\$4,816,440	\$5,757,940
29	Petroleum Refining	\$65,829,170	\$76,925,280
30	Rubber/Plastic Products	\$1,428,950	\$2,052,870
32	Stone, Clay, Glass and Concrete	\$5,358,200	\$6,555,400
33	Primary Metals	\$237,060	\$367,920
34	Fabricated Metal Products	\$1,630,890	\$2,577,100
35	Industrial/Commerc. Mach., Computers	\$26,500	\$35,680
36	Electronic Equipment	\$457,680	\$615,390
37	Transportation Equipment	\$5,529,390	\$8,268,060
38	Instruments, Photo., Med., Optical /2/	unknown	unknown
	Subtotal - Manufacturing	\$175,791,130	\$208,383,370
421	Motor Freight Transportation	\$321,930	\$321,930
44	Water Transportation	\$613,200	\$659,190
47	Transportation Services	savings	savings
49	Electric, Gas and Sanitary Services	\$101,945,230	\$115,406,760
517	Petroleum Distribution	\$239,070	\$255,130
554	Gasoline Stations	\$268,270	\$268,270
58	Eating/Drinking Establishments	\$11,771,250	\$13,231,250
80	Health Services	\$1,006,810	\$1,063,680
82	Educational Services	\$185,810	\$196,300
TOTAL ANNUAL COMPLIANCE COSTS - ALL AFFECTED INDUSTRIES /1/		\$292,142,700	\$339,785,880

Source: Applied Development Economics, based on data provided by the BAAQMD.

SIC refers to the Standard Industrial Classification system promulgated by the Federal Office of Management and Budget.

Notes:

/1/ Compliance cost estimates are based on anticipated emissions reductions and cost-effectiveness data for proposed SCMs. Data does not include savings or cost estimates for 14 SCMs due to a lack of emissions and/or cost-effectiveness data for these proposals.

/2/ Industry has been identified as potentially impacted by proposed SCMs. However, compliance costs could not be estimated for this industry due to a lack of data on emissions and/or cost-effectiveness of proposed SCM.

TABLE 6

ESTIMATED DIRECT COMPLIANCE COSTS AS A SHARE OF INDUSTRY OUTPUT

SIC	Industry	Value of Industry Output /1/ (millions of 1991 \$)	Estimated Annual Industry Compliance Costs /2/	
			Amount (1991 \$: Maximum Case)	Percent of Industry Output
0	General Impacts/Manufacturing		\$102,110,470	na
49	Electric, Gas and Sanitary Services	na	\$115,406,760	unknown
29	Petroleum Refining	\$6,905	\$76,925,280	1.11%
58	Eating/Drinking Estab.	\$5,513	\$13,231,250	0.24%
37	Transportation Equipment	\$12,041	\$8,268,060	0.07%
32	Stone, Clay, Glass and Concrete	\$1,458	\$6,555,400	0.45%
28	Chemicals/Allied Products	\$3,569	\$5,757,940	0.13%
34	Fabricated Metal Products	\$2,834	\$2,577,100	0.09%
17	Construction	\$15,247	\$2,347,090	0.02%
30	Rubber/Plastic Products	\$1,544	\$2,052,870	0.13%
80	Health services /3/	\$6,615	\$1,063,080	0.02%
27	Printing and Publishing	\$4,593	\$770,170	0.02%
44	Water Transportation	\$2,540	\$659,190	0.03%
33	Primary Metals	\$1,202	\$367,920	0.03%
36	Electronic Equipment	\$13,679	\$335,060	0.00%
421	Motor Freight Transportation	\$2,617	\$321,930	0.01%
554	Gasoline Stations	\$2,452	\$268,270	0.01%
517	Petroleum Distribution	\$3,632	\$255,130	0.01%
82	Educational Services /3/	na	\$196,300	unknown
35	Indust./Commercial Mach., Computers	\$14,068	\$35,676	0.00%
25	Furniture and Fixtures /4/	na	unknown	unknown
26	Paper and Allied Products /4/	na	unknown	unknown
38	Instruments, Photo., Med., Optical /4/	\$5,616	unknown	unknown
22	Textile Mill Products /4/	na	unknown	unknown
47	Transportation Services	\$1,121	savings	savings
TOTAL ANNUAL COMPLIANCE COSTS - ALL IMPACTED INDUSTRIES /2/		\$103,321	\$339,785,900	0.33%

Source: Applied Development Economics, based on data provided by the BAAQMD.

SIC refers to the Standard Industrial Classification promulgated by the Federal Office of Management and Budget.

Notes:

/1/ Value of industry output estimates based on 1987 Census data.

/2/ Compliance cost estimates are based on anticipated emissions reductions and cost-effectiveness data for proposed SCMs. Data does not include savings or cost estimates for 14 SCMs due to a lack of emissions and/or cost data.

/3/ Value of output for Health Services includes only those facilities which are subject to the federal income tax (i.e., nonprofit activities are excluded). Value of output data for educational services is not available.

/4/ Industry has been identified as potentially impacted by proposed SCMs. However, compliance costs could not be estimated for this industry due to a lack of data on emissions and or cost-effectiveness of proposed SCM.

However, the control measures may impact employment through their effect on product prices, profit margins, and the demand for goods and services produced by complying industries. In order to protect profit margins, firms experiencing increased costs associated with SCM compliance will attempt to pass the cost increases along to their customers (consumers and other firms) in the form of higher product prices. Their ability to raise prices without negatively affecting profit depends on the nature of their markets. For example, firms which produce goods or services for the national market will be limited in their ability to raise prices above those offered by competitive firms located in regions without similar emission control measures. Further, firms producing goods or services with one or more of the following characteristics risk a substantial loss in sales if they attempt to increase prices: the good or service has many competing substitutes; the good is not considered a necessary purchase for the consumer or a required input for another firm; the good represents a significant portion of household income or firm costs. An increase in the price of a good or service with these characteristics will very likely result in a substantial decline in sales, causing a greater loss in revenue and profit than that which would result from absorption of all or a major portion of the required compliance costs.

In contrast, firms which produce goods/services characterized by the following are likely to be able to increase prices without a significant loss in sales: the firm's competitors are located in the region and face similar increases in costs due to emission controls; the good/service has few or no substitutes; the good is considered a necessary purchase by the consumer or is an important input into the production process of other firms; the good represents a small portion of the purchasing consumer or firm's budget. In industries producing these types of goods or services, the firm is likely to recover at least a portion of the increased compliance costs through product price increases.

To the degree that Bay Area firms are successful in passing along compliance costs, the resulting price increases will contribute to the region's rate of inflation. In addition, higher prices may result in some decline in demand for the firm's product, causing industry output and employment to fall. Firms which must absorb all or a major part of the additional costs will suffer a decrease in profits, resulting in further declines in production and employment.

Employment Impacts

The SCMs will increase costs for many industries and businesses in the region. In some cases, these costs may result in reduced employment or slower employment growth. It is estimated that the maximum direct employment loss associated with these measures would be approximately 1,750

manufacturing jobs and 410 in other employment sectors.¹²

This impact is partially mitigated by the fact that the proposed measures may also have positive effects on regional suppliers of equipment, machinery and other products required for compliance. As an example, several of the proposed coatings measures require the use of more efficient application equipment and procedures, with the result that producers of such equipment are likely to experience an increase in demand. To the degree that these products are manufactured in the Bay Area, this increased demand will have a positive impact on output and employment in these industries. Similarly, nearly 90 percent of the costs to the petroleum industry is for additional capital equipment. To the extent this equipment can be provided locally, the employment impacts can be neutralized.

Specific Industry Impacts

The impact of the proposed SCMs will most likely be greatest for two groups of industries: those experiencing the largest absolute increase in costs; and those for which compliance costs as a percent of the value of output are highest (see Table 6). According to these criteria, the following industries are likely to experience the greatest impact from implementation of the proposed SCMs: electric, gas and sanitary services; petroleum refineries; eating/drinking establishments; transportation equipment; stone, clay, glass and concrete; and chemicals and allied products. The implications of the proposed SCMs for these industries are discussed in the following sections. Again, the analytic focus is on the maximum cost case.

Electric, Gas and Sanitary Services. The electric, gas and sanitary services industry is expected to incur \$115.4 million in additional annual expenditures as a result of implementation of the proposed SCMs. As indicated previously, this increase in costs is larger than that estimated for any other industry (see Table 6). More than two-thirds of the compliance costs allocated to this sector (\$79.5 million) are the result of one measure (D3) to control emissions from electric power generating boilers through the installation of pollution abatement equipment. Currently there are 21 utility boilers in the Bay Area - all operated by the Pacific Gas and Electric Company (PG&E). Since PG&E is a regulated public utility, it is probable that the industry will be permitted to pass on all or a major share of the \$79.5 million in annual compliance costs to its customers through rate increases. Secondary impacts in the form of increased utility costs for power will be widespread, affecting both consumers and business enterprises, but will not create a significant burden on customers.

¹² The estimates are made on the assumption that businesses will seek to reduce proportionally all operating cost categories, including labor, in order to recover the increased compliance costs.

Additional compliance costs of \$35.9 million per year are associated with two additional measures. The first (D2) is intended to control emissions from stationary gas turbines, including cogeneration facilities and power plants. Compliance with this measure is likely to involve substantial capital expenditures (an average of \$4 million for a selective catalytic reduction system, plus annual operating costs of \$500,000), resulting in average annual costs to the industry of \$26.6 million. The second measure (D1) is directed toward the reduction of emissions from non-utility reciprocating engines and requires the installation and maintenance of add-on controls to currently unregulated engines with more than 50 HP. The BAAQMD has issued permits for 183 such engines in the Bay Area in this and other industrial sectors, but more are in operation (engines with less than 250 HP do not currently require permits). Total costs associated with this measure are approximately \$9.1 million.

Additional SCMs with modest or unknown cost impacts on this industry include the following:

- o A measure to reduce emissions resulting from organic liquid spill cleanup, and the cleaning of gasoline storage tanks, tank trucks, and railcars (B6); total compliance costs for this measure are estimated at \$215,000/year.
- o A measure to reduce emissions by eliminating uncontrolled gas venting during Liquid Petroleum Gas (LPG) transfers (B7); costs unknown. The problem is concentrated in small and medium facilities (large facilities use more efficient technology). However, compliance can likely be achieved through installation of a system costing less than \$1,000, with the result that cost impacts should not be significant.
- o Enactment of emission minimization management plan (F2: contingency measure); the intent is to freeze allowable emissions throughout the region at 1987 levels. Industry is to select most cost-effective method of achieving compliance for affected facilities; costs unknown.

Petroleum Refineries. At \$76.9 million per year, compliance costs for this industry are second only to those estimated for electric, gas and sanitary services. In addition, compliance costs for Bay Area refineries represent 1.0 percent of the value of output - the highest share of any industry analyzed. Approximately three-fourths of refinery compliance costs are associated with a single measure (D4) to reduce NOx emissions from industrial boilers, steam generators, and process heaters. Compliance with this SCM will most likely involve increased capital expenditures to replace existing burners with low-NOx burners. In some cases, additional expenditures for post-combustion flue gas treatment may also be required.

A second measure (C6), accounting for nearly 9 percent of compliance costs for petroleum refineries (\$6.8 mil./per year), is intended to reduce ROG emissions by requiring covers on wastewater processing equipment. Implementation of this measure by a typical refinery will involve replacement of wastewater holding ponds with covered tanks, requiring capital expenditures of approximately \$6

million. Annual operating costs for related vent controls are expected to increase by a modest amount (\$45,000/year).

An additional control measure (C5) is designed to reduce ROG emissions by requiring add-on controls and covers for oil-water separators, dissolved air floatation units, drains and junction boxes at refineries and oil production fields. Implementation costs for this measure vary substantially by the size of operation. For example, while compliance costs for the typical refinery are estimated at \$700,000 in capital expenditures with an additional \$300,000 in operating costs, small wastewater systems could be covered for less than \$1,000. In total, implementation of this proposal will cost the industry an estimated \$2.9 million per year.

Two additional measures are designed to reduce emissions from refinery valve leaks for a combined cost of \$3.3 million/year. The first measure (C1) requires the installation of rupture disks in system valves or the venting of valves to an abatement system (estimated cost per valve, \$5,000; average annual cost, \$2.2 million). Implementation of the second measure (C3) is intended to further reduce leaks by requiring more effective packing materials and gaskets, plus a more stringent industry inspection and maintenance program. Although an estimated 98 percent of industry equipment already meets the standards indicated in this measure, annual compliance costs for the remaining equipment are estimated at \$1.1 million.

A variety of additional proposed SCMs are expected to result in relatively modest compliance costs on the petroleum refinery industry. These measures have a combined, known cost of less than \$1.7 million/year and include the following proposals: reductions in emissions from organic liquid storage tanks through a variety of capital expenditures and changes in operations (B2); requirements for improved pump and compressor seals at refineries and chemical plants (C2); vapor recovery requirements involving the design and installation of a vapor balance system for use during railcar loading (B1); control of emissions from cleaning up organic spills through the use of portable carbon adsorption systems (B6); and measures to reduce leakage during vessel depressurization (C4). A measure to reduce emissions from gasoline delivery vehicles loading at bulk terminals (B4) is expected to result in unknown net savings to the industry.

Finally, two SCMs will impose unknown annual costs on refineries. The first measure (C7) is intended to reduce emissions from petroleum refinery flares through the use of an improved flare recovery system. Although the data is inadequate to provide an annual cost for this measure, available information suggests that the new systems may involve capital costs of \$5 million per refinery. A second measure (F2), proposed as a contingency measure, is referred to as the emission minimization management plan and proposes to freeze allowable emissions from major existing/-

permitted sources in the region at their 1987 levels. Although the details of this SCM have not been fully defined, it appears that the measure would not allow expansion of existing facilities if the new development results in an increase in the facility's emissions of controlled pollutants. Expansion would, however, be allowed if the industry adopted technologies to reduce emissions at existing facilities by an amount equal or greater than the increase resulting from the new development.

Eating/Drinking Establishments. Eating establishments are expected to incur the third largest absolute level of compliance costs (\$13.2 million) resulting from implementation of the proposed SCMs. All of these costs stem from one measure (E3), which proposes to reduce emissions from commercial charbroiling operations through the installation of add-on exhaust controls or by replacing conventional charbroilers with improved griddles. According to the BAAQMD, there are as many as 1,000 full service and fast-food restaurants located in the Bay Area which use charbroilers in their operations and which will, therefore, be affected by this SCM. Depending on how compliance costs vary with the size of operation, this measure may have some distributional impacts on this industry: of the more than 9,000 eating establishments located in the Bay Area, over half are relatively small operations with less than 10 employees.

Transportation Equipment. Estimated compliance costs for the transportation equipment industry total \$8.3 million per year. Although the overall industry impact is small relative to the value of output (0.07 percent), more than 80 percent of the compliance costs (\$6.9 million) will fall on the only automobile assembly plant currently located in the Bay Area (New United Motor Manufacturing Inc., or "NUMMI"). Implementation of SCM (A9) affecting this facility will require additional capital equipment expenditures, as well as a potential increase in material costs associated with the use of lower-VOC coatings and solvents. Remaining industry compliance costs (\$1.4 million) are the result of two proposed measures which would: impose minimum transfer efficiency requirements on aerospace coaters and reduce VOC-limits for some industry coatings (A3); and require use of lower VOC-solvents in the coating industry in general (A18). While the first measure will directly impact 10 major aerospace manufacturing and rework facilities currently located in the Bay Area, both measures are expected to affect hundreds of small- and medium-sized coating subcontractors. In addition to the costs associated with implementation of these measures, the use of more efficient application processes and lower-VOC coatings is expected to result in unknown savings as a smaller amount of coating material will be required to cover a given quantity of product.

Stone, Clay, Glass and Concrete. Compliance costs imposed on the stone, clay, glass and concrete industry by the proposed SCMs are estimated at \$6.6 million (0.45 percent of total value of output). These costs are associated with two proposed measures, each of which apply to identified facilities in the Bay Area. The first measure (D5) would reduce emissions from cement manufacturing plants by

establishing NOx standards for precalciner/kilns. The measure affects one plant in Cupertino; compliance will involve an estimated \$2.4 million in combined capital and operating costs per year. A similar measure (D6) sets NOx standards for glass melting furnaces and is expected to affect operations at four facilities (one additional furnace is already in compliance with this proposal). Compliance will most likely require process and combustion modifications estimated to cost a total of \$4.2 million per year.

Chemicals and Allied Products. While the chemical and allied products industry is likely to experience a substantial increase in research and development expenditures in order to produce the lower-VOC coatings, adhesives and solvents required by fifteen of the proposed control measures, this industry is not expected to experience significant negative impacts for the following reasons. First, production of the new coatings will most likely involve changes in product content and chemical make-up, rather than changes in operating procedures. Therefore, it is not likely that the industry will be required to undertake significant capital expenditures or that operating costs will increase. In addition, demand for coatings, adhesives and solvents is spread among a large number of industries and is relatively inelastic with respect to price (there are few alternatives for these products), with the result that any cost increases (R&D, production) are assumed to be passed along to the industrial user and consumer of its products and are analyzed within that context.

As a result of these industry characteristics, the direct impacts of the proposed control measures on the chemical/allied products industry are likely to be significantly less than suggested by the number of measures affecting the industry. Current estimates indicate that annual compliance costs resulting from implementation of all relevant SCMs will total \$5.7 million per year (0.15 percent of this industry's value of output). The majority of these costs (\$4.3 million) are the result of a single measure (D4) to reduce NOx emissions from industrial boilers, steam generators, and process heaters. As indicated in previous discussions, compliance with this measure will most likely involve increased capital expenditures to replace existing burners with low-NOx burners. In some cases, expenditures for post-combustion flue gas treatment may also be required. Additional control measures affecting this industry are intended to reduce emissions during the production, transmission and storage of chemicals, requiring a combination of increased expenditures for capital equipment, machinery, operations and maintenance of \$1.4 million per year.

Other Industries. As indicated by Table 5, a variety of additional specific industries will also be directly affected by implementation of the proposed SCMs. Of these, only three are likely to experience annual cost increases of more than \$2 million: fabricated metal products (\$2.6 million); construction (\$2.3 million); and rubber/plastic products (\$2.1 million). As a share of output, compliance costs for all three of these industries are relatively small, involving primarily the use of

more efficient coating technologies as well as the use of lower-VOC coatings. Impacts on the remaining fifteen industries are either estimated at less than \$1 million per year or are unknown.

General Impacts - Manufacturing. In addition to the costs allocated to specific industries in the preceding discussion, manufacturing firms in other industries will also experience an estimated \$102.1 million in annual compliance costs. Approximately 85 percent of these costs are associated with implementation of the measure (D4) proposing to limit NO_x emissions from industrial boilers, steam generators, and process heaters. In addition to the specific industries identified in previous discussions, this measure is expected to have broad impacts throughout manufacturing, affecting thousands of Bay Area firms operating their own boilers, steam generators, and process heaters.

A second measure regulating emissions from non-utility, internal combustion engines (D1) accounts for an additional \$16.4 million in compliance costs (16 percent of the total for general manufacturing). Implementation of this SCM will involve a combination of operational modifications, engine combustion modifications, and post-combustion flue gas treatment (selective and nonselective catalytic reduction). Again, this measure is expected to have broad impacts, affecting any firm which utilizes this type of engine in the production of its good or provision of its service. Three measures intended to reduce emissions from coatings, solvents and adhesives (A2, A10, A11) will also have broad impacts on any industry using these materials. Implementation of these measures are intended to encourage the use of lower-VOC coatings, solvents and adhesives, higher transfer efficiency technologies, and/or add-on controls. Total compliance costs resulting from these three measures are estimated at less than \$1 million per year.

Four additional measures will have an unknown cost impact on Bay Area industries. Increased enforcement of District regulations (F4) will increase industry costs to the degree that industries are not in compliance with existing measures. On the surface, efforts to promote energy efficiency (F3) will lower industry costs by decreasing the amount of energy required to produce a given level of output. However, the net cost impact will depend on the level of capital expenditures required to achieve new levels of efficiency. The net cost impact of required industrial postponement of selected activities on ozone excess days (G2) is also unknown. This rule is intended to postpone only activities that are discretionary (e.g. maintenance, painting, etc.) and should not affect critical production processes.

Rule F1, strengthening the existing BAAQMD review of new emission sources, may affect the location of new employment generating uses. Under the proposed rule, firms wishing to develop new facilities in the Bay Area will be required to offset any significant increase in emissions associated with the new development by decreasing emissions at existing facilities. Firms with no

existing facilities in the Bay Area can accomplish this by purchasing "banked emissions" or paying other, unrelated firms to adopt abatement technologies reducing current emissions by the required amount.¹³ Firms with facilities in the Bay Area may use the same approach to reduce existing emissions at their own facilities or at those of other firms. Although this requirement makes it more expensive for firms to move into or expand in the Bay Area, it does permit additional growth to occur. The level of compliance costs associated with this measure are unknown.

3.3 Economic Effects of Improved Health Conditions

One of the anticipated benefits of the CAP is improved health conditions as a result of better air quality. This benefit would extend to all residents of the region and could properly be included in the next chapter on general public impacts. However, certain specific aspects of this issue directly relate to business and employment and so the discussion is presented here. From a business perspective, improved health conditions not only enhance the well being of people, but also improve worker productivity and reduce health benefits costs. Within the health services industry itself, improved health conditions lower demand for health services and thus could result in lower employment among health care workers. While it is certainly unlikely that health care professionals would protest this result, it has an economic effect that must be recognized in the general balancing of costs and benefits of the CAP.

Projections of health benefits of the CAP are not available, but previous studies of measures to attain air quality standards provide some indication of the economic effects that may be expected. In 1983, the California Air Resources Board (CARB) commissioned a study, which was completed in 1986, to assess the benefits of air pollution control in California.¹⁴ The San Francisco Bay Area was one of the four regions chosen for analysis in this report. The analysis compared actual air quality conditions experienced in 1979 with projected conditions for 1987 assuming maximum controls were in place. A parallel scenario assumed only control technology required in 1960 was in place. The report estimated the health costs associated with higher levels of particulates and ozone and concluded that the health benefits of reduced pollution under the maximum control scenario would amount to \$2.1 billion (1988 dollars) annually in the region.

¹³ Banked emissions represent a share of emission reductions undertaken by a firm in advance of the implementation of a control measure requiring the reduction. A firm is usually allowed to bank 25 percent of total reductions undertaken prior to measure implementation.

¹⁴ Information for this section is obtained from: James S. Cannon, The Health Costs of Air Pollution, A Survey of Studies Published 1984-1989, American Lung Association, Washington D.C., 1990.

In 1987, total receipts from for-profit health care facilities in the Bay Area amounted to about \$5.75 billion.¹⁵ Although this represents only a portion of the total health care sector in the region, a \$2.1 billion decrease would clearly be a major impact. In Southern California, it has been estimated that this effect would reduce growth in jobs in health services by 20,586, although overall job growth due to health benefits would amount to 28,400 jobs per year.¹⁶ Air quality conditions are substantially different in the Bay Area, and information is not sufficient to make specific estimates of employment changes related to health benefits.

¹⁵ Bureau of the Census, Census of Service Industries, 1987. Information is given only for establishments subject to federal income tax (i.e. non-profits are not included.) The figure of \$6.615 presented in Table 5 is adjusted to 1990 dollars.

¹⁶ South Coast Air Quality Management District, Draft Socioeconomic Report for the 1991 Air Quality Management Plan, March 1991, pp. 5-3, 5-4.

4. IMPACTS TO COMMUTERS AND THE GENERAL PUBLIC

4.1 Demographic Characteristics of the Region

Population

Growth Trends. California's population dramatically increased during the 1980s. The State's total population expanded by 7.1 million between the Census years of 1980 and 1990. California's population increased by 31.3 percent during the decade, from 22.7 million in 1980 to 29.8 million in 1990. The nine county Bay Area grew 16.3 percent, or about half the growth rate in California during the decade. The population in the Bay Area counties grew by more than 840,000 people between 1980 and 1990.¹⁷

Santa Clara County absorbed 202,506 new people, which was more population growth than any other Bay Area county. Other large growth counties include: Alameda County, which absorbed 173,803 new people, Contra Costa County, which grew by 147,352 new people and Solano County, which added 105,218 new people. The Counties of Sonoma, San Mateo, and San Francisco also experienced significant population growth. Sonoma County's population expanded by 88,541, San Mateo County increased by 62,294, and San Francisco County increased by 44,985 people. The least amount of growth occurred in the Counties of Napa and Marin. Napa County's population increased by only 11,566 persons, and Marin County increased by 7,528 persons.

The most rapid population growth in the Bay Area occurred in Solano County. Solano County's population increased by 44.7 percent between 1980 and 1990, which substantially exceeded California's population growth rate. Population growth in Sonoma County and Contra Costa County grew more slowly than the rest of the state, but exceeded the Bay Area growth rate. Sonoma County grew by 29.5 percent and Contra Costa County grew by 22.4 percent between 1980 and 1990. The remaining counties grew more slowly than the Bay Area growth rate of 16.3 percent. Alameda County grew 15.7 percent; Santa Clara County, 15.6 percent; Napa County, 11.7 percent; San Mateo County, 10.6 percent; and San Francisco County, 6.6 percent. Marin County grew by 3.4 percent.

¹⁷ The 1980-1990 population comparison is based on recently released Census data, published by the State Department of Finance, Report C90-PL-1, Table 2. The ABAG projections for this period show a 771,161 increase in population, or about eight percent below actual growth.

Ethnic Characteristics. There are differences between the racial and ethnic population mix of California and the Bay Area (see Table 7). The Bay Area has a much smaller Hispanic population than does all of California; 15.3 percent of the Bay Area's population is Hispanic, while Hispanics comprise 25.8 percent of California's population.¹⁸ In contrast, the Bay Area has a larger proportion of Asian and Pacific Islanders than does all of California. Asians and Pacific Islanders comprise 14.7 percent of the Bay Area's population and only 9.1 percent of California's population. The remaining ethnic mix in the Bay Area is essentially similar to that of the rest of the state. Whites comprise 60.7 percent of the Bay Area's population and 57.2 percent of California's population. Blacks comprise 8.6 percent of the Bay Area's population and 7 percent of California's population. Other races comprise 0.7 percent of the Bay Area's population and 0.8 percent of California's population.

Solano and Contra Costa County's racial mix most closely resembles that of the Bay Area as a whole. Solano County has a slightly higher black population (12.9 percent compared to 8.6 percent) and a slightly lower Asian population (11.9 percent compared to 14.7 percent) than the regional norm. In Contra Costa County, Blacks comprise 9.1 percent of the population, which is close to the regional norm. Asian and Pacific Islanders account for only 9.2 percent and Hispanics account for 11.4 percent which is slightly below the regional norm. Whites comprise 69.7 percent of Contra Costa County's population, which is slightly above the regional norm.

The Counties of Marin, Napa, and Sonoma are characterized by less racial diversity. Marin County is 84.6 percent White, Sonoma County is 84.3 percent White, and Napa County is 80.8 percent White. Only 3.3 percent of Marin County's population is Black, 3.9 percent is Asian, and 7.8 percent is Hispanic. The Hispanic population in Napa and Sonoma amounts to 14.4 percent and 10.6 percent, which more closely resembles the regional average. Only 1.1 percent of Napa County's population is Black and 3.1 percent is Asian and Pacific Islander. Only 1.4 percent of Sonoma County's population is Black and 2.6 percent is Asian and Pacific Islander.

The Counties of San Mateo and Santa Clara are characterized by their high percentage of Asian and Pacific Islander population. Asians and Pacific Islanders account for 16.2 percent of San Mateo County's population. San Mateo County has 5.2 percent Black population, which is below the regional average; 60.4 percent is White and 17.6 percent is Hispanic. Santa Clara County has 3.5 percent Black, 58.1 percent White, and 21 percent Hispanic residents.

¹⁸ Department of Finance, op cit., Table 1.

TABLE 7

ETHNIC CHARACTERISTICS OF CALIFORNIA AND BAY AREA COUNTIES, 1990

	Number of Persons						Percent of Total				
	Total	White	Black	Asian & Pacific	Other	Hispanic	White	Black	Asian & Pacific	Other	Hispanic
California	22,667,902	18,030,893	1,819,281	1,253,818	2,563,910	4,544,331	79.5%	8.0%	5.5%	11.3%	20.0%
Bay Area	5,179,784	3,895,810	467,016	449,662	367,296	632,542	75.2%	9.0%	8.7%	7.1%	12.2%
Alameda	1,105,379	740,612	203,612	85,899	75,256	129,962	67.0%	18.4%	7.8%	6.8%	11.8%
Contra Costa	656,380	534,628	60,172	30,563	31,017	55,820	81.5%	9.2%	4.7%	4.7%	3.5%
Marin	222,568	206,118	5,477	5,426	5,547	9,204	92.6%	2.5%	2.4%	2.5%	4.1%
Napa	99,199	90,856	887	2,095	5,361	8,636	91.6%	0.9%	2.1%	5.4%	8.7%
San Francisco	678,974	395,081	86,414	147,426	50,053	83,373	58.2%	12.7%	21.7%	7.4%	12.3%
San Mateo	587,329	458,489	35,487	56,305	37,048	73,339	78.1%	6.0%	9.6%	6.3%	12.5%
Santa Clara	1,295,071	1,017,854	43,716	99,935	133,566	226,611	78.6%	3.4%	7.7%	10.3%	17.5%
Solano	235,203	174,181	27,785	17,377	15,860	24,773	74.1%	11.8%	7.4%	6.7%	10.5%
Sonoma	299,681	277,991	3,466	4,636	13,588	20,824	92.8%	1.2%	1.5%	4.5%	6.9%

Source: Applied Development Economics based on California Department of Finance, Report C90-PL-1, Table 1.

Alameda County is characterized by a relatively high percentage Black population; 17.4 percent of Alameda County's population is Black, compared to 8.6 percent in the region. Alameda County has a lower percentage of whites, accounting for 53.2 percent of the total.

San Francisco County has the most racial and ethnic diversity in the Bay Area. Whites are a minority in San Francisco, accounting for 46.6 percent of the total population. San Francisco also has a very large Asian population, which amounts to 28.4 percent. Blacks comprise 10.5 percent and Hispanics comprise 13.9 percent of the total population.

Household Size. The average number of persons in each household in the region declined from 2.57 persons per household in 1980 to 2.54 persons per household in 1990. The greatest declines in household size occurred in the Counties of Marin, Napa, and Contra Costa. Marin County had 2.43 persons per household in 1980, which declined to 2.29 persons per household by 1990. Napa County had 2.55 persons per household in 1980, which declined to 2.45 persons per household by 1990. Contra Costa County had 2.69 persons per household in 1980, which declined to 2.57 persons per household by 1990. San Francisco is the only area that increased in household size. San Francisco County had 2.19 persons per household in 1980, which increased to 2.27 persons per household by 1990.

Income and Poverty Characteristics. The results of the 1990 economic census have not yet been published, but the 1980 census data showed the Bay Area's mean household income to be \$39,736 (1988 dollars).¹⁹ The Counties of Marin, San Mateo, Santa Clara, and Contra Costa all had higher mean household incomes than the regional average, while the remaining counties had mean household incomes lower than the regional average (see Table 8).

The region experienced a real growth in income of 14 percent between 1980 and 1988, but this was due as much to increase labor force participation as to growth in income per worker (43 percent to 45 percent, respectively). Growth in investment income accounted to 12 percent. Real income per employee is actually below 1972 levels due to "the combined factors of a highly competitive international market in the 1980s and the destructive inflation of the late 1970s."²⁰ Since 1980, real income has been increasing. ABAG projects a nine percent increase in regional mean household income by 1990, with Santa Clara County enjoying a 20.1 percent increase.

Data from the 1980 census shows much less poverty in the Bay Area than in the remainder of

¹⁹ ABAG, Projections 90. Figures are shown in 1988 dollars.

²⁰ Raymond J. Brady, 1989, op cit., p. 16.

TABLE 8
INCOME AND POVERTY CHARACTERISTICS

	Mean Household Income		Percent Change	Percent In Poverty 1980
	1980	1990		
Bay Area	\$39,736	\$43,300	9.0%	7.5%
Alameda	\$35,609	\$40,100	12.6%	11.0%
Contra Costa	\$43,407	\$49,600	14.3%	7.5%
Marin	\$50,340	\$62,700	24.6%	6.7%
Napa	\$36,891	\$40,200	9.0%	7.7%
San Francisco	\$33,612	\$41,200	22.6%	2.8%
San Mateo	\$45,209	\$51,700	14.4%	6.0%
Santa Clara	\$43,370	\$52,100	20.1%	7.0%
Solano	\$34,510	\$37,200	7.8%	9.1%
Sonoma	\$34,391	\$38,000	10.5%	9.3%

Source: Applied Development Economics

Notes:

All income figures in 1988 dollars.

Bay Area household income based on ABAG, "Projections '90".

Poverty statistics obtained from California State Office of Economic Opportunity,

"The Status of Poverty in California 1983-84", n.d.

California.²¹ In 1980 only 7.5 percent of the Bay Area's population was in poverty, while 11.6 percent of California's population was in poverty.²² The counties of Alameda (11 percent), Sonoma (9.3 percent), Solano (9.1 percent), and Napa (7.7 percent) all had rates of poverty higher than the regional average, but all are below California's poverty rate of 11.6 percent. Contra Costa (7.5 percent), Santa Clara (7 percent), Marin (6.7 percent), and San Mateo (6 percent) all had poverty rates below the regional average. San Francisco's 1980 poverty rate was 2.8 percent.

Housing

The 1990 Census indicates that the Bay Area experienced a 20 percent growth in households since 1980. This is about 4 percent, or 81,000 units, higher than ABAG had projected. Solano, Sonoma and Contra Costa counties experienced the highest household growth rates during this period, but the greatest amount of growth occurred in Santa Clara and Alameda counties. These two counties contributed nearly 160,000 new units, or about 40 percent of all housing growth in the region.

Despite the strong growth in Alameda and Santa Clara counties, ABAG projects there will be an unmet housing need of about 16,850 units between 1990 and 1995 due to continued job growth in these counties.²³ San Francisco is estimated to have an additional 7,360 unit shortfall during this period. Contra Costa, Napa, Solano and Sonoma counties are all projected to have excess housing development in relation to job growth.

The Bay Area has experienced extremely high housing costs for a number of years, due in part to the lag in housing production in relation to job growth. ABAG estimates that only 13 percent of Bay Area residents meet lending criteria to buy a median priced home in the area.²⁴ This has had the effect of driving workers to less expensive areas outside the Bay Area, and thus increasing vehicle miles traveled (VMT) faster than population and employment increases.

²¹ The poverty level is defined in terms of income scaled to the number of persons in the family. For the 1980 census, using 1979 income data as established by the Office of Management and Budget, \$7,412 was defined as poverty level for a family of four.

²² California State Office of Economic Opportunity, The Status of Poverty in California 1983-84, Sacramento, n.d.

²³ ABAG, Residential Demand and Development Potential in the San Francisco Bay Region - Options to Accommodate Residential Growth, Working Paper 91-1, Oakland. January 1991. p. 15.

²⁴ Ibid., p. 17.

4.2 Impacts of the Transportation Control Measures

Employer Based Trip Reduction Measures

Employer programs to reduce vehicle trips may increase the costs of commuting for some workers. These costs would be mitigated partially by reduced commute times. TCM 2 entails the BAAQMD and local governments adopting employer-based trip reduction rules which require employers to take direct steps to reduce commuter trips. Some of the proposed measures would increase commuter costs, including employee parking charges to discourage auto use. The programs may also offer incentives which would lower commuters' costs for travel alternatives such as subsidized transit passes, carpool/vanpool subsidies, telecommuting policies and the like. These measures may offset much of the cost of this rule to commuters, but may increase the cost of living for those workers who are unable to use transit alternatives or other vehicle sharing programs.

In Phase 1, the employee parking charges, estimated not to exceed \$3/day, are optional and may be imposed at the discretion of each employer. Employers may set programs to provide options for commuters without charging parking fees. For those commuters unable to avoid or share the parking charge, the annual cost would be about \$750. As an example of potential impact levels, this cost represents about three percent of very low income levels for a family of four in Alameda County. It is estimated that the average cost to workers would be about \$470 per year due to ride sharing, for an aggregate annual charge of \$1.46 billion (1991 dollars).²⁵ Employees who already pay for daily parking or whose employers opt not to adopt the fees in Phase 1 would not pay increased costs of commuting.

In Phase 3, the parking charges become mandatory. At that time, it is intended that employers would have established transit and carpool incentive programs to provide viable alternatives for virtually all workers. However, those workers unable to use alternative modes of commuting would be subject to the fees.

It is anticipated that funds collected from this measure would be used to pay for other components of the program such as transit and ridesharing incentives. Thus, workers who can use these alternatives will benefit from the costs imposed on other workers. Other than the costs to employers and government agencies to administer the program, all costs represent transfers from one segment of commuters to another. That is, of the \$1.46 billion cost indicated above, only \$155 million represent actual net costs to society. Private employers are expected to pay \$150 million to administer the

²⁵ MTC, Preliminary Cost Calculations for TCMs, November 1990, p. 9. Figures adjusted to 1991 dollars.

programs, and local government agencies would pay the remaining \$5 million per year. The remaining \$1.3 billion in worker costs would essentially represent transfers from workers who pay the parking fees to workers who can make use of the transit subsidies and other incentives offered through the employer-based programs. Moreover, it is estimated that the savings in travel time due to reduced congestion from this rule and the programs in TCM 1 will amount to \$108.5 million for workers and shippers who continue to drive during peak periods.²⁶

The employer-based trip reduction programs may contribute marginal pressure toward a redistribution of housing value, increasing values in proximity to transit facilities and reducing values at other housing locations. The magnitude of this effect will depend on the actual cost differences achieved through the program between auto and transit commuting.

Mobility Improvements

Increased transit efficiency and improved freeway conditions will reduce costs to workers. The congestion reductions associated with increased transit usage are estimated to save drivers about \$266.3 million annually in addition to the savings directly to business. Moreover, studies have shown that low income persons tend to use transit at a much higher rate than the general population, so the measures related to bus and rail transit improvements should provide a benefit to low income groups.²⁷ Additional direct benefits to low income transit patrons are contemplated in several fare reduction and user incentive programs associated with TCM 3 and TCM 11.

The costs of these transportation improvements must be paid in part from local resources. That is the intent of the revenue measures in Phase 2 of the CAP. These measures, which include increasing bridge tolls to \$2.00, adding \$4.00 per year to vehicle registration fees, and increasing the gas tax an additional \$0.14 per gallon will increase consumer expenses. For single occupancy vehicles, the bridge toll increase would constitute a \$250 per year charge, representing the highest financial impact of any of these measures. The annual \$4.00 increase in registration fees would be nominal in impact. The increase in the gas tax would cost the average Bay Area driver (12,000 miles per year) an additional \$65 dollars per year. The combined cost of these measures on the public is estimated at \$203.6 million per year.²⁸

²⁶ Deakin/Harvey/Skabardonis, Inc., op cit.

²⁷ National Economic Development and Law Center, "Communities at Risk: Regional Transportation issues in the Bay Area: The Concerns of Communities of Color and Low Income Neighborhoods," Berkeley, March, 1990.

²⁸ MTC, 1990, op cit. Figures are adjusted to 1991 dollars. Estimates assume that about 90 percent of total costs are paid by the public, and 10 percent by businesses.

Although they can be burdensome on the average commuter, these kinds of measures distribute the cost impacts of reduced pollution emissions in an efficient manner.²⁹ Many counties in the region have also adopted sales tax surcharges for transportation improvements. However, it should be recognized that the sales tax is essentially a regressive form of revenue generation with higher impacts to low and moderate income households. Given the user incentive programs and fare reduction programs included in the CAP, the incidence of this financial impact for funding CAP mobility improvements may fall most on middle income households who continue to use their automobiles for work and shopping trips.

Market-Based Measures

As discussed in the chapter on business impacts, the market-based TCMs involve a higher level of consumer impact. The aggregate costs to drivers could reach \$3 billion per year. In order to illustrate the impact of this on various segments of the population, we can convert the \$3 billion figure from 1991 dollars to 2005 dollars and estimate the average impact per household in 2005 when all the measures would be in place. In 2005, the total costs would be about \$5.94 billion in current dollars and it is projected there will be 2,706,200 households in the region, meaning that on average the costs would be \$2,195 per household per year. Households would pay more or less than this amount depending on their auto use.

Unlike the case with the Phase 2 revenue measures, households below the poverty level would be most impacted by the market-based measures. If the 1980 poverty levels remain unchanged, nearly half a million Bay Area residents would live in poverty by 2005. Projecting the 1980 poverty income level to 2005, an increase in living costs of \$2,195 represents nearly 7 percent of gross income. In Alameda County, where the 1980 percentage of persons in poverty was the highest in the region, the current very low income standard for a family of four is \$23,400.³⁰ Projecting this income level to 2005, the \$2,195 increase in cost of living would represent nearly five percent of gross income. This would be considered a significant adverse impact on the cost of living for low income residents. In comparison, the financial impact of the market-based measures would be just over 2 percent of the average household income in the region.

The reduced congestion from these revenue measures would provide a benefit of about \$1.1 billion (1991 dollars) per year to drivers in the region. These costs function as transfers within society to individuals willing and able to adjust their travel patterns to increase use of transit modes, as well as

²⁹ Michael Cameron, Transportation Efficiency: Tackling Southern California's Air Pollution and Congestion, Environmental Defense Fund and Regional Institute of Southern California, March 1991.

³⁰ Data provided by Eric Uranga, Alameda County Planning Department.

helping to enhance the general quality of life through improved air quality. To the extent that low income residents are able to make these adjustments, the financial impacts of the market-based measures can be avoided. The BAAQMD must carefully review the implementation of these measures, as well as other cost bearing CAP proposals, to ensure that unequitable cost impacts do not occur. On a statewide level, proposals have also been discussed to accompany policies that use a market-based approach to pricing auto transportation facilities with an income tax transportation credit, similar to the renters' credit currently allowed by the state. Through this mechanism, the impact of these kinds of measures could be reduced for economically disadvantaged groups.

Additional Implementation Support Measures

TCM 18, which would encourage high density development and transit-oriented design in proximity to transit stations and facilities, may affect the location and availability of housing choices. It is likely that by increasing densities, this measure would increase the stock of affordable housing, as well as increasing the efficiency and reducing the cost of using transit for those residents living closer to the stations. Higher density housing often permits lower development costs and increases the opportunity for home ownership and lower rental rates for a broad segment of the population.

ABAG recently conducted a land use analysis to determine the potential for increasing transit use through alternate development patterns.³¹ The effort focused on identifying undeveloped land along transit corridors, which is currently designated for employment-generating land uses, but which could be redesignated to residential so that more workers could commute by transit. The report notes that in 1985 there were 71,200 acres of land available for commercial and industrial development in the region. On the other hand, the amount needed to meet employment growth projections between 1990 and 2010 is only 21,000 acres, meaning that there is a sizable surplus of non-residentially zoned land in the Bay Area. By shifting some of this land located in transit sensitive areas to residential uses, ABAG suggests that the total housing production could be increased by 163,940 units, or nearly six percent of the housing inventory projected to be available in 2010. Alameda and Santa Clara Counties would experience the highest acreage shifts from commercial to residential uses.

Vehicle Control Measures

Many of the drivers affected by the high polluting vehicle retirement program (proposed as a contingency measure) and the smoking vehicle reporting programs would be low income persons. Data from the 1981 Bay Area Travel Survey indicates that lower income persons use a greater

³¹ ABAG, Increasing Transit Ridership and the Efficiency of land Use While Maximizing Economic Potential; Working paper 90-2, October 1990.

percentage of older vehicles.³² The BAAQMD will need to review the implementation of this measure to ensure that the cash payments to vehicle owners for vehicle retirements fully mitigate the impact of the program.

4.3 Stationary Control Measures.

Increased costs for industry may have inflationary impacts on consumer prices. Given the broad range of potential industry impacts of the SCMs, it is not possible to quantify all the price impacts that may occur in the region. One example of such an impact, however, is the impact on the electric, gas and sanitary services sector, which is expected to incur \$115.4 million in additional annual expenditures as a result of implementation of the proposed SCMs. As indicated above in the discussion of employment impacts, this increase in costs is larger than that estimated for any other industry. More than two-thirds of the compliance costs allocated to this sector (\$79.5 mil.) are the result of one measure (D3) to control emissions from electric power generating boilers through combustion modifications, including the installation and maintenance of low-NOx boilers. Currently there are 21 utility boilers in the Bay Area -- all operated by the Pacific Gas and Electric Company (PG&E). Since PG&E is a regulated public utility, it is probable that the industry will be permitted to pass all or a major share of the \$79.5 million in annual compliance costs on to its customers through rate increases. Secondary impacts in the form of increased utility costs for power will be widespread, affecting both consumers and business enterprises. According to PG&E's 1990 Annual Report, total electric revenues in 1990 were \$7 billion; to completely cover \$79.5 million in additional annual costs, current revenues from this source would have to increase by 1.1 percent. Spread evenly, this would be about \$19.00 per customer per year, including commercial and industrial accounts. It is likely that the burden of this cost will be spread in proportion to the size of customer utility bills, so that large commercial and institutional users would pay a higher percentage than would the average residential account. Thus it is not expected that this impact would be significant for most residents.

Increased costs for architectural coatings and adhesives will likely be passed on to households and industry, particularly construction firms. This may increase the cost of housing construction. However, since the total cost impact to the industry is less than one percent (0.2 percent) of all construction output in the region, it is unlikely that this effect will be noticeable in relation to the general housing price inflation in the region.

³² DHS, Inc., op cit.

5. IMPACTS TO LOCAL GOVERNMENT

5.1 Trends in Local Government Spending

Since Propositions 13 and 4 passed in the last decade, local governments have struggled with the need to meet increasing service demands with fewer resources. As property taxes have become less dominant in local budgets, sales taxes, user fees and a host of new kinds of assessment districts have become vital components of the resource base at the local level. Redevelopment activity has also increased as local jurisdictions attempt to focus scarce property tax dollars in areas where service and infrastructure needs are most severe.

Transportation funding has also undergone changes as sales tax surcharges have been passed in several Bay Area counties, and transportation authorities have been established to administer the funds. In recent elections, voters have approved new gas tax increases and bond measures to fund transportation infrastructure. Counties are now required to prepare Congestion Management Plans in an attempt to coordinate transportation and land use planning.

The following discussion highlights some of the trends in local government spending in the Bay Area, and outlines sources of revenue for local transit agencies.

Combined City/County Government Expenditures

Total real per capita city and county government expenditures increased in every Bay Area county from fiscal year (FY) 1978/79 to 1988/89 (refer to Table 9).³³ By far the largest absolute growth took place in the city and county of San Francisco, where per capita expenditures rose by \$727, an amount more than twice the second largest increase of \$361 in Santa Clara county. Both Santa Clara and San Francisco counties experienced the most rapid expansion in city/county government expenditures over the decade: between FY1978/79 and 1988/89 expenditures rose by 35 percent in Santa Clara and 33 percent in San Francisco. City and county government in Sonoma county also expanded by more than 30 percent, although the absolute growth in per capita expenditures in this

³³ This discussion is based on data contained in: State Controller's Office, Financial Transactions of Cities, Financial Transactions of Counties, and Financial Transactions of Special Districts, Sacramento, (1978/79, 1988/89). Unless otherwise indicated, all data in the following discussion have been adjusted for inflation and are expressed in constant 1989 dollars.

TABLE 9

CITY AND COUNTY EXPENDITURES IN THE BAY AREA, FY 1978/79 - FY 1988/89

	Combined City/County Expenditures					
	FY 1978/79		FY 1988/89		Percent Change	
	Transportation Expenditures (1989 dollars)	Total Expenditures (1989 dollars)	Transportation Expenditures	Total Expenditures	Transportation Expenditures	Total Expenditures
Alameda	\$105,856,247	\$1,295,872,842	\$144,746,795	\$1,480,593,740	36.7%	14.3%
Contra Costa	39,411,874	563,404,998	68,771,364	772,218,141	74.5%	37.1%
Marin	12,338,881	166,330,131	19,987,719	218,029,551	62.0%	31.1%
Napa	9,418,818	76,334,626	9,437,385	105,248,404	0.2%	37.9%
San Francisco	285,644,163	1,586,606,277	495,784,351	2,186,455,546	73.6%	37.8%
San Mateo	34,153,447	507,636,985	52,166,096	660,609,377	52.7%	30.1%
Santa Clara	89,231,054	1,280,853,189	215,416,499	2,014,531,089	141.4%	57.3%
Solano	17,217,587	214,694,064	27,518,649	350,616,446	59.8%	63.3%
Sonoma	27,182,572	227,222,248	42,232,342	401,258,572	55.4%	76.6%
Total	\$620,454,642	\$5,918,955,359	\$1,076,061,200	\$8,189,560,866	73.4%	38.4%

Per Capita City/County Expenditures

	FY 1978/79		FY 1988/89		FY 1978/79 to FY 1988/89 Change			
	Transportation Expenditures (1989 dollars)	Total Expenditures (1989 dollars)	Transportation Expenditures	Total Expenditures	Amount		Per Cent	
					Transportation Expenditures	Total Expenditures	Transportation Expenditures	Total Expenditures
Alameda	\$94	\$1,156	\$116	\$1,183	\$21	\$26	22.4%	2.3%
Contra Costa	\$64	\$911	\$89	\$996	\$25	\$84	39.1%	9.3%
Marin	\$57	\$768	\$86	\$940	\$29	\$172	51.3%	22.4%
Napa	\$100	\$813	\$88	\$978	(\$13)	\$165	-12.5%	20.3%
San Francisco	\$399	\$2,217	\$668	\$2,944	\$268	\$727	67.3%	32.8%
San Mateo	\$60	\$885	\$82	\$1,044	\$23	\$159	38.5%	18.0%
Santa Clara	\$72	\$1,037	\$150	\$1,398	\$77	\$361	107.0%	34.8%
Solano	\$80	\$1,004	\$86	\$1,092	\$5	\$88	6.5%	8.8%
Sonoma	\$99	\$828	\$114	\$1,080	\$15	\$252	14.7%	30.4%
Average	\$123	\$1,169	\$183	\$1,394	\$61	\$225	49.4%	19.2%

Source: Applied Development Economics based on data from State Controller's Office

county was at the lower end of the scale (an increase of \$88, the seventh largest among the counties). Governments in Marin, Napa and San Mateo counties also produced double-digit growth in per capita expenditures (18 to 22 percent), with absolute increases in the mid-range of \$159 to \$172. Per capita expenditures in Solano and Contra Costa counties increased at a relatively modest pace, while city and county government expenditures in Alameda increased by the smallest amount of any of the Bay Area counties (only \$26 per person, or 2 percent, for the entire decade). For the Bay Area as a whole, combined city and county expenditures rose by just over 19 percent or \$225 per person.

By the end of 1989, total per capita city/county expenditures in San Francisco (\$2,944 per person) were well over twice the second highest level of expenditures (Santa Clara at \$1,398). In FY 1988/89, these two counties accounted for over half of the total expenditures of all city and county governments in the region. This undoubtedly reflects the added costs of providing services to the largest job centers in the region. Per capita expenditures in the remaining seven counties were within \$250 of each other, ranging from \$1,183 per person in Alameda County to a Bay Area low of \$940 in Marin.

City/County Transportation Expenditures

Trends in city/county transportation expenditures are generally similar to those experienced for total expenditures.³⁴ The city and county of San Francisco has experienced the most substantial growth. From FY 1978/79 to 1988/89, per capita transportation expenditures increased by \$268 per person, approximately two and a half times the second largest growth of \$77 occurring in Santa Clara. These two counties also produced the most rapid growth. Per capita transportation expenditures in Santa Clara more than doubled over the decade, resulting in the fastest growth of any Bay Area county, while San Francisco expenditures increased at the second highest rate (67 percent). City and county governments in four counties (Marin, Contra Costa, San Mateo and Alameda) all increased transportation expenditures by \$21 to \$29 per person, while Sonoma (plus \$14) and Solano (plus \$5) produced the smallest absolute growth. Napa produced the only decline in per capita transportation expenditures over the decade (a drop of 13 percent, or \$13/person).

At the end of the 1980's, per capita transportation expenditures in San Francisco (\$668) were approximately four and one-half times the next highest level of expenditures (\$150 per person in Santa Clara). In terms of total transportation expenditures, San Francisco is clearly dominant among

³⁴ This discussion is based on data contained in: State Controller's Office, Financial Transactions of Cities, Financial Transactions of Counties, and Financial Transactions of Special Districts, Sacramento, (1978/79, 1988/89). Unless otherwise indicated, all data in the following discussion have been adjusted for inflation and are expressed in constant 1989 dollars.

Bay Area governments. In FY 1988/89, total transportation expenditures in San Francisco represented 46 percent of total expenditures for this purpose by all city and county governments in the region. Local governments in Alameda and Sonoma counties each spent \$113 to \$115 per person on transportation, while expenditures in the remaining five counties ranged between \$82 and \$89 per person. In FY 1988/89, per capita transportation expenditures in the Bay Area as a whole averaged \$183, for a decade growth of just under 50 percent (\$61/person).

Shifts in City and County Expenditure Patterns

Over the preceding decade, city and county transportation expenditures in the Bay Area have grown much more rapidly than total expenditures. From FY 1978/79 to 1988/89, while total per capita expenditures increased by 19 percent, city/county expenditures for transportation rose by 49 percent per person. By the end of the period, transportation expenditures represented 13 percent of all city/county expenditures, ranging from a high of 23 percent in San Francisco to a low of 8 percent in Solano and San Mateo counties. Transportation expenditures represent between 9 and 11 percent in all remaining counties.

Excluding San Francisco from the analysis, total per capita expenditures have grown more rapidly in the Bay Area's cities than in its counties.³⁵ From FY 1978/79 to 1988/89, the region's cities increased their per capita expenditures by 26 percent (\$122 per person), while county expenditures rose by only 11 percent (\$52).

Analysis of changes in per capita expenditures suggest a significant change in the way transportation services are funded between county and city governments. Over the preceding decade, per capita transportation expenditures fell by 25 percent in the region's counties (minus \$6 per person), while city expenditures for this purpose rose by 86 percent (plus \$43). Again excluding San Francisco, per capita transportation expenditures made by county governments fell in every county in the Bay Region over the FY 1978/79-1988/89 period, ranging from a decline of 49 percent in Solano to minus 4 percent in Alameda County. At the same time, per capita city government transportation expenditures rose in every county but one, increasing by rates ranging from 167 percent in Santa Clara cities to 28 percent in Alameda County cities. Cities in Napa County produced the only decline in per capita transportation expenditures (a drop of 11 percent, or \$5, per person). Over this same period, total per capita expenditures for the city and county of San Francisco increased by 33 percent

³⁵ Data for the City and County of San Francisco are reported together. Therefore, in the following discussion of shifts in expenditure patterns between city and county governments in the Bay Area, data for San Francisco has been analyzed separately as a unique Bay Area government entity.

(\$727), while transportation expenditures grew by 67 percent (\$268).

One reason for the shift in county expenditures away from transportation may be the establishment of transportation authorities in a number of the Bay Area counties. For example, by FY1988/89 transportation authorities in Alameda, Contra Costa, San Mateo and Santa Clara counties had accumulated more than \$156 million in sales tax revenues earmarked for transportation projects.³⁶ That is nearly 50 percent more than the county public works departments in all nine Bay Area counties spent cumulatively on transportation in that year.

Redevelopment Agencies

Redevelopment Agencies (RDAs) have been additional sources of increased public expenditures in the Bay Area over the preceding decade. On a per capita basis, expenditures from this source rose by 85 percent, or \$42, between FY 1978/79 and 1988/89. By the end of the period, per capita expenditures made by RDAs in Bay Area counties averaged \$93 per person. However, the range of expenditures among counties is relatively broad. Only three counties are characterized by RDA expenditures in excess of \$100 per person: Santa Clara has the highest level of expenditures (\$166), followed by Solano (\$142) and Contra Costa (\$101). Expenditures in the remaining counties are substantially less, ranging from \$69 in Alameda to a regional low of \$11 per person in Napa.

County growth rates for RDA expenditures exhibit even greater variation, in part due to the relatively small levels of RDA expenditures characteristic of several of the counties in FY 1978/79. While the largest absolute increase occurred in Solano County (plus \$142 per person), the highest rate of growth occurred in San Mateo (plus 7,870 percent or \$35 per person). Per capita RDA expenditures in two counties actually declined over the decade: expenditures in San Francisco fell by 57 percent, or \$62, per person, while Contra Costa RDA expenditures dropped by 24 percent (minus \$33).

Metropolitan Transportation Commission.

The Metropolitan Transportation Commission (MTC) represents an additional important source of funds for transportation projects in the Bay Area. MTC reviews transportation projects in the region requesting state and federal grants, and sets regional priorities for the allocation of state and federal transportation grants. During FY 1989/90, MTC allocated funds for transportation operating and capital expenditures totaling \$704 million, or about \$117 per capita. Funds include direct allocations

³⁶ State Controller's Office, Financial Transactions for Transportation Planning Authorities in California, 1988/89, Sacramento, 1990.

made by MTC as well as grant applications approved by MTC for forwarding to state or federal agencies (see Table 10).

Reasonably comparable data on MTC allocations is available for FY 1983/84 and FY 1989/90. This data shows that real allocations under the Transportation Development Act have increased by 30 percent, while toll bridge revenues are up by 21 percent. However, state transit assistance has dropped by almost two-thirds compared to FY 1983/84, while federal funding for urban mass transit has fallen by over 50 percent. Over the same period, Federal Highway Assistance funds allocated through the MTC have increased by 45 percent. The net change in all allocations from FY 1983/84 to FY 1989/90 is an increase of 25 percent (\$142 million).³⁷

Transit Services

Operating data for the major transit services in the Bay Area (shown in Table 11) indicates that while operating revenues have grown in real terms by 12 percent (\$87 million), average ridership on all transit services has dropped slightly (-1 percent). The small net decline masks larger losses for AC Transit (-18 percent), San Francisco Muni (-5 percent) and San Mateo County Transit (-11 percent). In general, ridership on other transit systems has grown, including a 16 percent increase on BART, a 35 percent increase on the Caltrain system, and a 15 percent increase on the Santa Clara County Transit.

Community Infrastructure Problems

ABAG's survey of local infrastructure issues suggests that despite real increases in per capita expenditures, local governments have lost ground in maintaining facilities.³⁸ The document reports results of an infrastructure survey sent to local planning departments by ABAG (survey completed in December, 1989). The survey measures local planning departments' perceptions of infrastructure as a constraint to growth and attempts to identify local actions currently being taken to minimize existing problems. For purposes of the survey, infrastructure was defined as roads, schools, sewerage processing and outflow capacity, and solid waste disposal. The survey updates two

³⁷ Source of data is MTC annual reports for each year.

³⁸ Raymond J. Brady, Community Infrastructure Problems: Third in a Series of Surveys of Bay Area Planning Departments, ABAG, Oakland, Working Paper 90-1, June 1990.

TABLE 10

METROPOLITAN TRANSPORTATION COMMISSION ALLOCATIONS BY SOURCE

	FY 1983/84 (1989 dollars)	FY 1989/90	Change	
			Amount	Percent
Transportation Development Act (TDA)				
Transit Operations	\$106,053,861	\$144,365,582	\$38,311,721	36%
Transit Capital	\$5,767,138	\$4,988,871	(\$778,267)	-13%
Community Transit Operations	\$7,372,466	\$8,589,958	\$1,217,492	17%
Community Transit Capital	0	\$284,744	\$284,744	NA
Streets and Roads	\$5,836,239	\$3,887,379	(\$1,948,860)	-33%
Pedestrian and Bicycle	\$2,379,813	\$3,937,976	\$1,558,163	65%
TDA Subtotal	\$127,409,517	\$166,054,510	\$38,644,993	30%
AB 1107/Transit Operations	\$35,289,800	\$36,340,332	\$1,050,532	3%
Toll Bridge Revenues	\$12,357,693	\$14,898,660	\$2,540,967	21%
State Transit Assistance				
Operations	\$25,676,571	\$821,754	(\$24,854,817)	-97%
Capital	\$44,653,297	\$25,615,924	(\$19,037,373)	-43%
Subtotal	\$70,329,868	\$26,437,678	(\$43,892,190)	-62%
Federal Funds (UMTA, FHA, FAA)				
Urban Mass Transit (Section 9, 18)	\$165,424,358	\$85,472,454	(\$79,951,904)	-48%
Urban Mass Transit (Section 3, 6, 10, 20)	\$140,007,583	\$60,058,848	(\$79,948,735)	-57%
Federal Highway Assistance	\$11,866,673	\$315,449,000	\$303,582,327	2558%
Subtotal	\$317,298,614	\$460,980,302	\$143,681,688	45%
TOTAL ALLOCATIONS /1/	\$562,685,492	\$704,711,482	\$142,025,990	25%

Source: Applied Development Economics based on Metropolitan Transportation Commission Annual Reports.

Notes

/1/ Excludes \$8,070,759 in FAA funds in FY 1989/90.

TABLE 11

MAJOR TRANSIT SERVICES IN THE BAY AREA

	Operating Revenues (thousands of 1989 dollars) /1/				Average Daily Ridership /2/			
	FY 1983/84	FY 1989/90	Change		FY 1983/84	FY 1989/90	Change	
			Amount	Percent			Amount	Percent
Alameda/Contra Costa County Transit								
District (AC Transit)	\$121,772,742	\$127,034,000	\$5,261,258	4%	235,000	193,100	(41,900)	-18%
BART	\$170,758,042	\$192,983,000	\$22,224,958	13%	207,800	241,500	33,700	16%
Caltrans	\$30,866,472	\$28,561,000	(\$2,305,472)	-7%	15,500	21,000	5,500	35%
Central Contra Costa County								
Authority (County Connection)	\$7,336,966	\$12,221,000	\$4,884,034	67%	11,400	15,300	3,900	34%
Eastern Contra Costa County Transit								
Authority (Tri-Delta)	\$2,043,496	\$2,097,000	\$53,504	3%	1,400	2,000	600	43%
Fairfield Transit	\$467,558	\$714,000	\$246,442	53%	500	1,300	800	160%
Golden Gate Bridge Highway and								
Transportation District	\$42,787,290	\$42,270,000	(\$517,290)	-1%	36,200	35,300	(900)	-2%
Livermore Transit	\$912,184	\$3,153,000	\$2,240,816	246%	1,300	2,400	1,100	85%
Napa City Transit	\$510,874	\$855,000	\$344,126	67%	1,500	2,100	600	40%
San Francisco Muni	\$214,811,688	\$252,393,000	\$37,581,312	17%	800,000	761,200	(38,800)	-5%
San Mateo County Transit	\$33,297,264	\$34,932,000	\$1,634,736	5%	63,000	56,000	(7,000)	-11%
Santa Clara County Transit	\$111,094,074	\$123,450,000	\$12,355,926	11%	119,000	137,000	18,000	15%
Santa Rosa Transit	\$1,646,008	\$2,786,000	\$1,139,992	69%	3,900	5,300	1,400	36%
Sonoma County Transit	\$2,424,422	\$3,392,000	\$967,578	40%	3,300	3,200	(100)	-3%
Union City Transit	\$923,650	\$1,151,000	\$227,350	25%	1,300	1,700	400	31%
Vallejo Transit	\$1,727,544	\$2,973,000	\$1,245,456	72%	4,600	7,000	2,400	52%
Western Contra Costa County Transit								
Authority (WestCAT)	\$1,349,166	\$620,000	(\$729,166)	-54%	900	1,000	100	11%
REGIONAL TOTAL	\$744,729,440	\$831,585,000	\$86,855,560	12%	1,506,600	1,486,400	(20,200)	-1%

Source: Applied Development Economics based on MTC Annual Reports.

Notes:

/1/ Data for FY 1983/84 represents operating revenues; data for FY 1989/90 represents operating expenses.

/2/ Data for FY 1983/84 represents average daily ridership; data for FY 1989/90 represents average weekday boardings.

previous surveys conducted in 1985 and 1987. Relevant survey results include:

- o According to local planning departments, all infrastructure problems have become worse since the first two surveys. Among these problems, roads are considered to be the most serious: in 1989, over 60 percent of all survey respondents ranked road infrastructure problems as critical or severe. Road problems were also ranked as critical in the earlier two surveys, indicating that planners see little or no improvement in this important Bay Area infrastructure.
- o Additional infrastructure problems ranked as critical for the first time in the 1989 survey include: sewerage processing and outflow capacity, and water supply. The addition of these areas to the critical list indicates that local planners believe that infrastructure problems are generally getting worse.
- o Finally, 82 percent of all planning departments responded that "infrastructure problems in the severe or critical stage would affect the timing of development in their communities." This represents a significant increase over the 1985 survey, in which only 56 percent of planners thought that infrastructure problems would affect development timing.

5.2 Impacts of Transportation Control Measures

Some of the expenditures required to implement the TCMs would be made by MTC and the BAAQMD. Local government would experience operational or financial impacts from other measures. In addition to specific implementation costs discussed in detail in this section, general local government impacts would result from the following:

- o Decreased air pollution/improved air quality is expected to result in improved public health through a decrease in pollution-related diseases. Public health improvements should result in a decrease in worker absence due to illness, decreasing direct employee costs, as well as indirect costs associated with insurance contributions and reimbursements. Impact: decreased local government costs; amount unknown.
- o Public health organizations (clinics, hospitals, primary care facilities) are likely to experience a decrease in demand for health services (healthier population results in lower usage). Impact: decreased revenues to public health organizations; amount unknown.
- o Decreased traffic congestion would result in lower travel times and transportation costs, lowering government expenditures for work-related travel (staff time, fuel, vehicle maintenance and replacement). Impact: lower government transportation costs; amount unknown.
- o Improved air quality, lower traffic congestion/transportation expenditures may make the Bay Area more attractive as a potential location for business, increasing local government revenues (taxes, fees) in the future. To the degree that more stringent control measures (stationary and transportation) discourage industries from locating within the region, local governments will suffer a loss in future tax revenues. Net effect unknown.

More specific impacts may occur from the following measures.

Employer Based Trip Reduction Rule

The BAAQMD expects to delegate the implementation of TCM 2 to cities and counties who have adopted local trip reduction ordinances (TROs). Many local jurisdictions will adopt TROs to comply with congestion management ordinances. It is likely that these ordinances would need to be revised to comply with the BAAQMD regional rule, and this would increase local government costs above what they would otherwise be required to spend on the congestion management programs.

Local governments and the BAAQMD are anticipated to spend about \$5 million (1991 dollars) per year enforcing the employer trip reduction measures. This cost could be covered by charging employers a fee, by authorizing general fund expenditures, by revenues from yet-to-be-authorized State legislation raising the vehicle registration fees (AB 434), or by a combination of these possibilities.

Improved Bicycle Access

TCM 9 proposes to expand bicycle carrying capabilities on mass transit; provide means for bicycles to cross all existing and future Bay bridges; require all Bay Area cities and counties to prepare comprehensive bicycle plans; and increase the number of local and regional bicycle routes to shopping, employment, civic, cultural and educational centers. Transportation Development Act funds are available for Phase 1 bicycle access improvements. Phase 2 improvements will require additional state funding (legislation to be proposed by MTC). Depending on the availability of funds and matching requirements (if any), local funding may be required for preparation of comprehensive bicycle plans, capital expenditures by local transit authorities to expand bicycle carrying capacity on mass transit, and the development of additional bicycle routes. Deakin/Harvey/Skabardonis, Inc. estimates \$500,000 in initial planning costs for cities and counties, plus an additional \$20 million per year for Phase 2 bicycle access improvements funded by MTC.

Youth Transportation

TCM 10 proposes to reinstate school bus service, fund youth discount tickets for public transit and encourage carpooling for high school students. Deakin/Harvey/Skabardonis, Inc. estimates that implementation of this measure will require \$150,000 in initial planning costs, plus annual expenditures of \$26 million to fund youth discount tickets, provide school bus services and encourage

student ridesharing. Implementation of this measure requires State legislation to provide funding. Assuming full funding is approved without a required local match, the local government fiscal impact of this measure will be insignificant. However, there may be incidental operating and financial impacts to local school districts, depending on how the measure is implemented.

Improve Arterial Traffic Management

TCM 12 proposes a combination of efforts to improve traffic flows on local arterials, including improved signal-timing programs, improvements in the movement of bus traffic, and designation of SMART streets (local arterials to relieve congestion from traffic incidents on adjacent freeways). Deakin/Harvey/Skabardonis, Inc. has identified initial costs of \$250,000 and annual costs of approximately \$4 million to implement this measure. The description of the TCM states that implementation will require state legislation to provide funding for signal-timing programs, including the purchase and maintenance of new signal equipment by cities. Assuming no local match, this measure should not have a significant fiscal impact on local government. However, there may be operating or financial impacts if full state funding cannot be secured.

Indirect Source Review

TCM 16 would add a new indirect source review element to the review and approval process for new development/construction. The measure requires specific consideration of a proposed development's impact as an indirect source of air pollution. Indirect sources are defined as those which attract vehicle trips (e.g., commercial and residential facilities, universities, sports facilities, airports, etc.). The measure will require new development to reduce associated traffic and emissions. A separate program will also be applied to existing development. Either BAAQMD will conduct indirect source review or will delegate authority to conduct review to cities and counties. Local government costs will involve additional staff time required to conduct the reviews. To the degree that local government is involved in the development of public facilities which represent an indirect source of air pollution, government will also incur additional development costs associated with required mitigation measures. Deakin/Harvey/Skabardonis, Inc. identifies \$12 million in annual local government costs resulting from this TCM. The BAAQMD is seeking a source of funds (AB 434 - increase in vehicle registration fees) for local governments who are delegated indirect source control authority.

Local Plan Elements

Two measures propose additions to local planning activities. TCM 18 would encourage the preparation of zoning plans for higher densities near transit stations and along transit corridors. Plans would be prepared by cities and counties in cooperation with transit operators. Deakin/Harvey/Skabardonis, Inc. estimates the cost of preparing these plans to be \$500,000 per year. Although additional state funding will be requested for this effort, it is anticipated that most of these costs will be borne by local government.

Implementation of TCM 19 would require the addition of an air quality element to city and county plans. BAAQMD would work with local governments in the development of these plans. Deakin/Harvey/Skabardonis, Inc. estimates the cost of preparing the air quality elements at \$2 million per year. The BAAQMD is seeking a source of funds (AB 434 increase in vehicle registration fees) for local governments to develop, adopt, or revise an air quality element.

Requirements for Clean Vehicle Program

This measure would require operators of vehicle fleets to purchase and operate either clean fuel vehicles (i.e., vehicles which operate on methanol, compressed natural gas, liquid petroleum gas or propane, and electricity) or gasoline-powered vehicles with extremely low emissions. Affected vehicles include light duty passenger vehicles, and light and medium duty trucks. Compliance may be achieved either by conversion or replacement of existing vehicles. Additional expenditures may be required for fuel dispensing units. Currently available cost data for this measure is insufficient to determine whether or not there will be cost-savings associated with more efficient vehicle operation. Vehicles running on LPG are said to enjoy an 11 percent overall cost savings relative to gas-powered vehicles, while electric vehicles are about one-third higher. Assuming no major technological changes, this measure will have a potentially negative fiscal impact on local government organizations operating fleets of vehicles.

5.2 Impacts of the Stationary Control Measures

As indicated in the discussion on industry impacts, combined, known compliance costs for all proposed stationary control measures are estimated to range from a minimum of \$292.1 million to a maximum of \$339.9 million. Industrial sectors expected to be directly affected by the SCMs include manufacturing and selected segments of the public utility, trade, service, and transportation industries. Assuming that affected firms are able to pass along all or a portion of their increased costs to customers in the form of price increases, the cost of doing business and residing in the Bay

Area will go up, affecting other businesses, consumers and local governments throughout the region. For example, the industry analysis identified compliance costs of \$79.5 million associated with implementation of one measure affecting PG&E. As a regulated industry, it is likely that PG&E will be permitted to pass most or all of these costs along to consumers, resulting in an increase in electric rates throughout the region. In addition to increased utility costs, local government may also experience increases in the cost of purchases made from other local industries affected by the proposed measures, (e.g., coatings, adhesives, solvents, petroleum products, construction).

Measures which may have a direct impact on local government expenditures include the following:

- o To the degree that local government institutions are involved in the use of adhesives, solvents and the application of coatings to infrastructure and equipment, they will be affected by the expected increase in the cost of these materials resulting from SCMs requiring the development and use of reformulated lower-VOC products and/or more efficient application technologies.
- o The proposed SCM (A17) to control emissions from household solvent disposal is intended to encourage cities and counties to adopt programs for proper disposal of VOC-containing household wastes, including improved local hazardous waste disposal programs. Estimated compliance costs for this measure are unknown.
- o Two measures intended to control NOx emissions from non-utility reciprocating engines (D1) and from boilers, steam generators and process heaters (D4) are expected to have broad economic impacts throughout manufacturing, requiring an increase in operating and capital costs for affected sectors. While compliance costs for these measures were estimated only for the private sector, to the degree that local government utilizes these types of engines and operates its own boilers, steam generators and process heaters, it too will be affected.

5.4 Summary of Local Government Fiscal Impacts

The total annual costs identified in the above discussion for implementation of the employer-based trip reduction rules, local bicycle plans, indirect source review, high density zoning programs, and local air quality elements total nearly \$20 million per year (1991 dollars). While the impacts to certain small jurisdictions may be significant, the overall expenditure adds only about \$3.50 per capita to local government expenditures.⁹ This would not appreciably raise the 1988 average per capita expenditure level for local governments, which totaled nearly \$1,400 (Table 9).

⁹ This calculation is made using adjusted 1988 dollars and population figures.

6. SUMMARY OF EMPLOYMENT IMPACTS

The various components of the CAP would have different impacts on regional employment. These impacts have been discussed in the pertinent sections of this report and are summarized here to provide an overall view of the net impacts. It must be emphasized that it is not possible in every case to translate business impacts of CAP control measures into employment effects. Whether increased business costs lead to reduced employment levels depends on the ability of the industry to pass such costs on to intermediate producers or to consumers. For many industries, substitutions for labor are not necessarily available, and other kinds of cost cutting measures must be undertaken. Thus, in Table 12, which summarizes the various categories of employment change, a number of unknowns are indicated. These categories are shown, however, because it is likely that some change in employment would occur, even though the level of impact cannot be estimated.

6.1 Direct Employment Impacts

The top portion of the table indicates where employment reductions may occur. ADE has made an estimate of the impact of the stationary control measures, based on the relationships of labor costs to the operational characteristics of the businesses directly affected by the measures. Of the 2,160 permanent job loss, about half results from general impacts to manufacturing businesses, while the remainder is heavily concentrated in the petroleum industry and the restaurant sector, where significant cost impacts would occur. The electric and gas industry is not expected to incur employment losses due to compliance costs of the SCMs (although these costs are also substantial), because of the regulated nature of the industry.

As noted in Tables 3 and 4 in Chapter 3, several kinds of transportation services industries are actually expected to achieve cost saving due to SCM regulations. No estimate has been made as to whether this might result in increased employment in these firms. However, it may also be surmised that Bay Area firms would take advantage of some of the new business opportunities created by SCMs requirements for new technologies, product formulations and industrial processes. There is no information currently as to how many existing firms in the region supply the specified equip-

TABLE 12

SUMMARY OF EMPLOYMENT IMPACTS

	Direct Employment	Indirect and Induced Employment	Total Employment
ADVERSE IMPACTS			
Impact of Stationary Control Measures	(2,160)	(8,970)	(11,130)
Health Services	Unknown	Unknown	Unknown
Market Based TCMs	Unknown	Unknown	Unknown
BENEFICIAL IMPACTS			
Technology and Product Development to Comply with Stationary Control Measures	1,080	4,490	5,570
Transit Operations	2,880	6,450	9,330
Agriculture	Unknown	Unknown	Unknown
Impact of Increased Worker Productivity	Unknown	Unknown	Unknown
ESTIMATED NET IMPACT ON ANNUAL BAY AREA EMPLOYMENT			
	1,800	1,970	3,770
TRANSIT PROJECT CONSTRUCTION EMPLOYMENT OVER TEN YEARS			
	25,000	41,250	66,250
Source: Applied Development Economics			

ment or other products needed to comply with the SCMs. However, since the Bay Area has a diverse economy that produces a wide variety of both industrial equipment and chemical products, it is assumed that at least half of the employment loss from firms adversely affected can be recovered in firms whose market base expands as a result of the CAP measures. Thus, in the second portion of Table 12 indicating beneficial impacts, the figure of 1,080 permanent job is shown.

Two other categories of potentially adverse impacts have not been estimated, including those in health services firms and agencies, and those resulting from costs throughout the economy related to the market-based Transportation Control Measures. Improved health conditions are a major benefit of the CAP and should result in increased worker productivity and a general benefit to business as well as to the regional population. However, the resulting decrease in demand for health services could have an adverse impact on job growth in health services occupations. Table 12 identifies both lost health services employment and potential increases in worker productivity as impacts of the CAP, although specific job estimates are not available.

The increased costs associated with the market-based TCMs may also have adverse employment impacts. These costs, which may reach several billion annually, would pervade the economy, resulting in higher prices for products and an impaired competitive position for firms whose primary business is export based. It is not possible with available information to estimate what kinds of businesses may reduce employment in response to these measures, nor what countervailing effects the mobility improvements may have on business operations. Consequently, no employment impacts estimates have been made. It should also be noted that most if not all of the market-based fees would be transfers within the regional economy, rather than net costs to society. That is, the fees paid by businesses and drivers would help create the beneficial impacts of the CAP such as reduced traffic congestion, reduced health costs, and increased worker productivity among others. Thus, the negative employment impacts that may occur in some businesses, would be offset by employment increases in other businesses.

In terms of beneficial employment impacts, the CAP would increase employment in construction industries, transit agencies and local government as the expanded transportation system is built and operated. It is estimated that the maximum transportation operations employment increase would be nearly 3,000 permanent jobs, or a 40 percent increase over 1988 employment levels. The construction employment increase is shown at the bottom of Table 12, since it would occur over a ten year period and not on a permanent basis.

Unquantified employment benefits would occur for transportation sensitive businesses such as retail and services firms dependent upon transportation access for customers and service calls. MTC has

estimated that the permanent employment gain from this source may reach 14,000 jobs, but a specific number is not shown in Table 12 because of the unknown adverse employment impacts of the market based TCMs. Finally, in addition to overall increased worker productivity due to improved health conditions, the agriculture industry should experience improved crop yields as the clean air standards are achieved. This may result in some employment benefits, although in general agricultural employment has been declining in the Bay Area.

Overall, based on employment impacts that can be estimated, it appears that the CAP would have a net positive impact generally on the regional economy. This conclusion depends largely on the ability of the regional economy to capitalize on business opportunities created by new control standards, and on the ability of the BAAQMD to implement the Phase 3 measures in a way that maximizes the benefits of the Phase 2 mobility improvements and reduces the impact to essential business sectors for which transportation alternatives are not feasible.

The challenge regionally is to provide sufficient services to those workers whose jobs are lost to permit them to readily reenter the active workforce. Table 13 indicates the occupational distribution of jobs lost and gained. The jobs lost are concentrated in production, services and professional fields. Fortunately, the job gains also heavily favor production occupations, although a small net loss in services jobs is forecast. This sector is the largest and fastest growing segment of the economy, however, and job opportunities are widespread.

6.2 Secondary Employment Impacts.

The primary employment impacts resulting from adoption of the proposed stationary control measures will also have secondary impacts on the general level of economic activity in the Bay Area. For example, the direct job losses generated by the SCMs would in turn result in employment decreases in businesses supported by these industries and their employees. It is estimated that the 2,160 direct job loss created by the SCMs would engender further losses in indirect and induced jobs of 8,970 throughout the region.⁴⁰ In column two of Table 12, similar estimates are made for the quantified beneficial employment impacts. The net result is an increase of about 3,770 jobs over those lost as a result of the CAP.

⁴⁰ Estimate prepared by ADE based on employment multipliers provided in: ABAG, 1982 Input-Output Model and Economic Multipliers for the San Francisco Bay Region, 1988 Update, November 1988.

TABLE 13

OCCUPATIONAL DISTRIBUTION OF DIRECT EMPLOYMENT CHANGES

	Job Losses	Job Gains	Net Change in Permanent Employment	Temporary Construction Employment Gains /1/
Management and Administration	135	165	30	1,175
Professional and Technical	340	770	430	1,550
Sales	80	65	(15)	625
Clerical and Administrative	260	530	270	2,700
Services	325	90	(235)	125
Production	1,020	2,340	1,320	18,825
TOTAL	2,160	3,960	1,800	25,000

Source: Applied Development Economics, based on EDD Occupational Employment Statistics Report.

Notes:

/1/ Based on a ten year construction period.

7. ALTERNATIVES

The BAAQMD has developed several alternatives to the proposed CAP as a means of testing the program strategies and in order to meet requirements of the California Environmental Quality Act (CEQA). The alternatives are briefly addressed below.

7.1 No Project

While the California Clean Air Act requires that the BAAQMD adopt a clean air plan, CEQA requires that the environmental analysis examine alternatives to the "project" (the CAP), including the "No Project" alternative. The CAP as proposed is projected to have a net positive impact on employment in the region. While the stationary control measures would increase costs for business and possibly result in employment losses of about 2,160 jobs, this impact is offset by increases in employment in transit and government agencies due to implementation of the transportation control measures. With proper phasing, the adverse impacts of the Phase 3 measures would be offset to some degree by improved access and reduced travel costs for business. In addition, the proposed mobility improvements would generate more than 250,000 construction jobs over a ten to twenty year period. The No Project Alternative would thus have an adverse employment impact in comparison to the proposed plan.

Under the No Project alternative, indirect source review and intensified zoning policies proposed in the plan would not be implemented. If the land use policies associated with these programs are not implemented, the region would have fewer options for increasing housing production and reducing the sub-regional imbalances between labor force and jobs that tend to increase regional transportation costs and create fiscal hardship for local government.

The No Project Alternative would not achieve the positive economic benefits of improved air quality including increased worker productivity, improved mobility and increased amenities.

7.2 Accelerated Market-Based TCM Alternative

This alternative would move up the market-based TCMs for immediate implementation, rather than in Phase 3 as the CAP proposes. This would mean that the mobility improvements would not be completed before the public and business community would begin absorbing significant increases in transportation costs. This would impose a particular hardship on low-income drivers without the resources to absorb the increased costs. The impacts would be widespread and would exacerbate the high cost of living which has already affected the ability of Bay Area businesses to recruit qualified labor.

According to ABAG projections, the region is facing an acute shortage of labor due to insufficient housing production. Business has experienced difficulty in recruiting workers from outside the region due to the high costs of housing and other living expenses. The market-based measures would result in billions of dollars of added costs to business and the general public. If these costs are imposed before adequate transportation alternatives are available, this would further retard the ability of business to expand in the region. This would have an adverse impact on employment growth in the short term until the mobility improvements are completed. If some businesses close their operations in the region rather than wait for uncertain implementation of the major transit and freeway improvements proposed in the CAP, this would cause the spread of economic blight in the affected communities that could lead to significant physical decay, loss of government revenues and significant environmental damage as local agencies and businesses are unable to maintain the infrastructure that is needed to protect environmental quality.

7.3 ROG - First Control Strategy Alternative

This alternative would accelerate the implementation of certain ROG measures and postpone the implementation of NOx measures. The ROG measures affected by this alternative represent about 10 percent of the total SCM compliance costs and about 20 percent of the adverse employment impact. Of the group of measures that would be shifted into Phase 1, the auto assembly rule (SCM A9) and the commercial charbroiling rule (SCM E3) impose the highest costs. Overall, however, the NOx measures, which would be shifted from Phase 1 to Phase 2 under this alternative, represent more than 85 percent of the total compliance costs. The net effect of this alternative on regional businesses, then, would be to lower Phase 1 costs by \$290 million. The cumulative effect of delaying the NOx measures four years would be to reduce total costs to industry by more than \$1 billion.

8. REPORT PREPARATION

8.1 Report Authors

LEAD AGENCY

Bay Area Air Quality Management District
939 Ellis Street
San Francisco, California 94109
(415) 771-6000

Contacts: Henry Hilken, Planner
Jean Roggenkamp, Environmental Review Manager

EIR CONSULTANT

EIP Associates
150 Spear Street, Suite 1500
San Francisco, California 94105
(415) 546-0600

Principal-in-Charge: John A. Davis
Project Manager: William F. Dietrich

SUB-CONSULTANT AND SOCIOECONOMIC REPORT AUTHOR

Applied Development Economics, Inc.
3254 Adeline Street
Berkeley, California 94703
(415) 653-3803

Project Manager: Douglas H. Svensson, AICP

Technical Staff: Kathleen Hamm
Stephen Wahlstrom

Word Processing: Ruth Oliver

8.2 Persons Consulted

Bay Area Air Quality Management District

Jean Roggenkamp
Henry Hilken
Irwin Mussen
Brian Bateman
Ellen Linder
Dan Belik
Jim Karas

Association of Bay Area Governments

Raymond J. Brady
Eugene Leong

Metropolitan Transportation Commission

Chris Brittle
Susan Pultz

Alameda County

Eric Uranga

Deakin/Harvey/Skabardonis, Inc.

Dr. Greig Harvey

Dowling Associates

Rick Dowling



C124905432